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THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

EDITED BY

THEO. S. CASE.

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REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VIII. JUNE and JULY, 1884. NO. 2-3

GEOLOGY.

THE RUSSELL ARTESIAN WELL.

JOHN D. PARKER, U. S. A., FORT HAYS, KANSAS.

Recently I made a visit to Russell, Kansas, and was very much interested in an artesian well which the citizens of that enterprising town have been boring. The town voted ten thousand dollars worth of bonds, and engaged a company from Milwaukee, Wisconsin, to make the boring which has not been put down as far as they contemplated at the beginning. As the drill did not take out a core, the boring at certain intervals was stopped, by pressure on the sides, and a smaller bore within the larger adopted, the whole bore appearing like an inverted jointed telescope, with the exception that the tubing of each bore comes to the surface of the ground. Each time a smaller bore was commenced within the larger bore there was some delay in obtaining the cast-iron tubing, which was manufactured at Pittsburg, Pennsylvania, and the company at last, at the time of one of those delays, abandoned the work.

It is impossible to say what may be the final adjustment of the matter, but it is hoped that the well will be completed with a diamond drill which takes out a central core, until if water is not sooner found, the depth of 3,500 feet has been reached, which was first contemplated. I deem this a matter of the highest importance, as a test of artesian wells in Western Kansas. If artesian wells can be obtained in Western Kansas, it will change the face of the whole country.

The soil is very rich and productive, and a good supply of water would make it one of the finest stock countries in the world. Fine forests would spring up in all parts, and the cereals and grasses would become more certain and abundant.

In Western Texas, the wonderful springs and the dip of the strata led to the boring of artesian wells. It was noticed that the springs were fed from a great distance, probably from the mountains, as they were not affected by the local rainfall. The Texas Pacific Railroad was rewarded in finding an abundance of the finest water in the artesian wells which they bored at Toyah, Texas, and at other places. The same results would probably follow in Western Kansas, and therefore, it is hoped that the people at Russell may thoroughly test this matter, which has such a vital interest to the welfare of the people living in this portion of the State.

Mr. F. C. Jerome, of Russell, has very kindly furnished me the following statement regarding this artesian well:

PROF. JOHN D. PARKER.

DEAR SIR.—Inclosed please find a report of the artesian well at this place, together with an analysis and classification of the rocks and shales, which you requested me to write for the KANSAS CITY REVIEW OF SCIENCE.

The most important question in Western Kansas is that of irrigation. This want does not arise from the fact that this portion of the State is barren, or that the general rain-fall is not sufficient. There are times, at least every few years, when drouths, more or less local, visit this section, entailing thereby many failures of certain crops, and it is from these visitations that has arisen the question of irrigation—how to provide for wheat and corn and other products when the rain-fall shall prove insufficient. As yet, Western Kansas is a very new field for agricultural pursuits, but very far from being unprofitable or experimental. In coming years it will be one of the grandest countries for farm products of every description, that the nation has ever seen, but now, being in its infancy, it must learn to creep before it can walk. The vast chalk beds must be decomposed and allowed to give out the immense quantity of lime and carbonic gas they contain, the crude gypsum must be made to unite with the soil by cultivation, and this cultivation to be successful must have an abundance of moisture to assist it in properly preparing the ground. The charactistic drouths that occasionally visit this section are mainly due to the newness of the country and the chemical changes going on with the minerals in the ground.

It was to solve this question definitely that the enterprising citizens of Russell voted bonds to the amount of $10,000 to sink an artesian well at this place, and although the work is not yet completed, the developements give us some very interesting facts to consider, and tell us something about this part of the State that could not be known in any other manner.

The following are the deposits encountered in the well up to the present writing, together with their composition and position. I have given the rocks the most careful examination, and they are exactly as reported:

CRETACEOUS PERIOD.	FEET.	INCHES.	TOTAL CRETACEOUS PERIOD.
BENTON GROUP.			
Upper Soil	10		
Yellow Clay, containing thin Magnesian Limestone	25		
Gravel and Fresh Water.			
Dark Blue Variegated Shale	70		
Trace of Coal.			
Dark Blue Variegated Shale impregnated with Talc	34		
Gray Sandrock impregnated with iron pyrites	15		
Vein of Fresh Water.			
Gray Friable Sand-rock	10		
Light Blue Soapstone	32		
Dark Blue Soapstone, containing coal	3		
Light Blue Soapstone	12		
Depth of Benton Group	211		211
DAKOTA GROUP.			
Light Blue Argillaceous Sand-rock	10		
Strong Vein of Salt Water.			
Blue, turning to pink, then red, Soapstone	17		
Red Sand-rock	2		
Vein of Hot Water.			
Red Sand-rock with Nodules of Ferruginous Limestone	60		
Light Blue Shale	15		
Light Gray Sand-rock with Iron Nodules	30		
Total Depth of Dakota Group	134		134
			345
UPPER CARBONIFEROUS.			
Gray Quartzose Rock	50		
Light Blue Pyritiferous Friable Sand-rock		.01	
Gray Quartzose Rock	5		
Brown Sand	9		
Brown Ferruginous Quartzite, containing gold, silver, copper and iron ore comglomerate	26		
Vein of Salt Water.			
Light Blue Shale	48		
Trace of Gypsum.			
Light Blue Shale	182		
Brick-red Calcareous Clay (Pottery Clay)	74		
Blood-red Marl (Fertilizer)	60		
Brick-red Calcareous Clay (Pottery Clay)	56		
Impure Gray Limestone, with Hornstone	35		
Dark Red Variegated Gypsiferous Shale	20		
Small Vein of Coal.			
Dark Red Variegated Gypsiferous Shale	67		
Coal.			
Total Upper Carboniferous	632	.01	

TOTAL DEPTH OF WELL.

Cretaceous	345.
Upper Carboniferous	632.01
Total No. of feet	977.01

RISE AND FALL OF WATER.

Amount of Water in Well at certain depths.		Distance from Water to top of the Well.	REMARKS.
Depth of Well.	Feet of Water.		
154 feet.	30	144 feet.	Cold.
159 "	60	109 "	Cold.
160 "	80	80 "	Cold.
240 "	100	140 "	Boiling hot.
260 "	156	104 "	Warm.
290 "	170	120 "	Lukewarm.
308 "	190	118 "	Cold.
380 "	180	200 "	Cold.
388 "	223	165 "	Cold.
395 "	230	165 "	Cold.
400 "	250	150 "	Cold.
435 "	259	176 "	Cold.
500 "	350	150 "	Cold.
880 "	700	180 "	Cold.
977 "	742	235 "	Lukewarm.

The rise in the temperature of the water first noticed at 100 feet.

The measurements and analysis of the rocks, etc. in the above tables are accurate, having taken the measurements myself as the work continued on the well. The only difference in opinion seems to arise in the geological distribution, in which Prof. O. St. John takes friendly exceptions with me. In a former report I classed the Benton group down to the Red Sandstone of the Dakota. Prof. St. John is under the impression that the Benton ends just above the fifteen foot stratum of gray sand-rock impregnated with iron pyrites.

In Western Kansas, and very prominent in Russell county, on Salt creek, four miles north of Russell, and in many places along the Saline river, the horizon rock of the Dakota group is a light blue argillaceous friable sand-rock. This appears to be a permanent feature so far as I have had leisure to examine them. The artesian well here is on the uniform high prairie, and I have found no indications of faults, or of intrusive rocks, and hence I am of the honest conviction that this light blue argillaceous friable sand-rock stratum is the true horizon rock of the Dakota, which I refer to above, and I have changed the report in this respect, believing this to be correct, and should any other errors appear, I will be glad to correct any and all, only desiring to learn the true facts.

My reasons for classing the quartzose rock with the upper carboniferous are, from what examination I have given this rock, it *appears* to be of a granulated structure, or metamorphic, though I am far from being satisfied, having

had but a very small specimen for examination. The pottery clay and marl referred to, are valuable deposits, and the clay, especially, is very pure.

The hot water referred to was sufficient to boil an egg in three minutes. The heat I am under the impression was caused by the iron pyrites by some chemical changes, not caused by the well, but which have continued probably for ages. I did not procure any of the hot water for analysis.

The yellow clay, underlying the upper soil, I have been fortunate in examining its structure for five feet ten inches, the remaining twenty feet I have not yet had opportunity to examine.

The following is the yellow clay at the Benton so far as I have had an opportunity to examine it:

Clay colored with Iron of aqueous formation and laminated, and of friable nature.	3 feet.
Lime, Magnesium and chalk, (natural lime) containing fossil fish scales, *Inoceramus*, and *Ammonites*, *with iron nodules*	1 foot.
Ferruginous limestone, containing fossils of *Inoceramus*, fish scales and *ctenoides gigantea* and sharks' teeth	0.10 inches
Silicious ferruginous limestone, (no fossils)	1 foot.
Total	5.10.

The work on the well has not yet been completed, and of course the matter of irrigation has not yet been settled, though I am pleased to say from present prospects the well will be completed successfully under government aid, and the question of artesian water will be settled. In this respect I am under the impression that a good vein will be tapped somewhere about 2,000 feet, as there is every indication to show that a very large vein underlies this locality, but this remains for future investigations to bring forward. Respectfully,

F. E. JEROME.

RUSSELL, KANSAS, April 26, 1884.

The anomaly in this boring is the finding of boiling hot water at the depth of two hundred and forty feet. This water must have derived its heat from local causes, as the increase of heat after passing the stratum of invariable temperature, is only one degree Fahrenheit for every fifty or sixty feet of descent.

MINES OF CARTERVILLE, JASPER CO., MISSOURI.

PROF. G. C. BROADHEAD.

The general surface is rolling with hills rising about eighty feet above the creeks. The creeks have narrow valleys rising by gentle ascent to the adjacent hills; which are sometimes modified by terraces.

The mining is confined to the valleys not far from the railroad, and are more productive from 100 to 125 feet below the surface. The ores are chiefly zinc.

From careful examinations we find as follows: The highest rocks seen near by are of a porous or bony looking chert. This occurs in broken and chiefly angular masses on the hill-tops. On the tops of the hills I also observed water-worn chert in considerable quantity and apparently of same age as the massive chert. Outcrops on the hill-sides and revelations in the shafts prove the existence of a limestone about five feet below the hill-tops. Fossils were obtained both from the chert and limestone, but only a few species. Among them I recognized *Spirifer Keokuk*, *Sp. lateralis*, *Hemipronites crenistria*, *A. Rhynchonella*, *A. Phillipsia*, *Bujozoa* and *Crinoid* stems. Sufficient to be identified with the Keokuk group of the Lower Carboniferous.

Shallow shafts in draws and valleys show quite an extensive deposit of a blue clay shale. The shale is thickly laminated, and may be of the same geological age as the limestones, but I could obtain no fossils from it. The fact of its being reached in the valleys, also in some shafts on the hillside (where it is found above the limestone) also occupying pockets or "bars" as the miner would say, would indicate that it was newer than the limestone. It really may have been deposited from a flow through cavities in the other older rocks, in caverns. Another fact, although found in the mines it is not ore-bearing, but generally contains a good deal of iron pyrites.

A general section of the rocks here, both concealed and exposed, is about this,—

1. Fifty feet of porous or bony chert with probably some concealed limestone.
2. Outcrop of limestone, generally bituminous with some blue clay in pockets.
3. Thirty feet of blue clay shale in valleys. It may be of more recent age than 1 and 2.
4. Fifty feet of gray crumbling bituminous limestone.
5. Twenty to thirty feet of chert in irregular broken layers, some altered to quartzite, with pockets and bands of blue clay. This is only reached by deep mining.

Bitumen is more abundant in the limestone beds, where it occurs sometimes as stains and in drops, and is also found in the form of solid asphalt.

Galena occurs in the Upper limestone but not abundantly, generally in the

form of cubes. It is more abundant in the broken chert beds. Beautiful octagonal crystals occur and we find them arranged in handsome clusters.

Zind blend (sphalerite) is chiefly abundant in the chert beds, acting as a cement to the broken fragments of chert, the whole appearing as a coarse breccia. The dark chert often contains disseminated blende; the white does not, but blende is often seen crystallized on the chert.

The general position of the strata in the mines is an approach to horizontality, but they undulate very much in the mines. In sinking the shafts the chert beds (No. 5,) are reached at eighty feet or more below the surface. They are much broken and sometimes do not seem to be at all stratified.

The lower chert beds (No. 5,) or mineral-bearing rocks, are of a white, gray, or dark blue. The ore is rarely contained in the chert itself, but is chiefly confined to the surface of the rock, but the darker colored rock sometimes is porous and includes mineral ores, apparently a replacement of the dissolved rock.

The clay bars, or bands, or pockets, rarely contain valuable minerals, but often contain a good deal of iron pyrites either in crystallized forms or else thoroughly impregnating the shale so as to darken it.

The darker chert is sometimes colored by the zinc ore. It also passes into a densely crystalline quartzite.

The ores are also sometimes found occupying drusy cavities which are sometimes beautifully studded with minerals. In them we sometimes find zinc blende, sometimes calcite, sometimes dolomite.

In the North Carterville mines a dark banded quartzite was observed, showing obscure deposits of zinc ore at the junction of bands and also disseminated ore.

At one place in the mines, the lowest seen rock was a dark banded quartzite, and a breccia of calcite, chert, and blende, with a deposite of galena just above. At another place found bituminous limestone. The quartzite sometimes presents a bony structure and incloses blende. Blende also occurs in cavities with pyrites crystallized upon it. Dolomite was found occupying spaces between the blende crystals. The granular blende is apparently of older age than the crystallized. The galena generally seems to be older than the blende, but sometimes they are of equivalent age. The pyrites is younger or newer than either. Their order of formation is about as follows:

I.—1. Galena, blende.
2. Galena, pyrite.
3. Galena, dolomite.

II.—1. Blende, pyrite.
2. Blende, dolomite.
3. Granular blende, crystallized blende, or condensed thus:

Galena,
Granular blende.
Crystallized blende.
Dolomite, Pyrite, Calcite.

The dark quartzite is newer than the white chert, as is proven by its containing fragments of white chert. The breccia is cemented by silicious matter, and by sulphuret of zinc.

Finally, the following is about the succession of mineral phenomena:

1. Geological period. Formation of limestone and white chert.
2. The rocks were fractured.
3. The limestones were partially disintegrated, and sometimes dolomized. Some ores were probably deposited.
4. Some of the chert was altered to quartzite. Ores deposited. Cementing of angular fragments of rock into a breccia.
5. Deposits of sulphurets of iron, oxides of iron. Deposits of calcite and dolomite.

From the above we find a certain resemblance to other mines of the southwest, but the Carterville mines are remarkable for excess of zinc ore, and small quantity of lead ore. Neither carbonates nor silicious ores were observed. On one specimen of zinc blende there was observed a minute stellate deposit which may be silicate of zinc.

LIST OF FOSSILS IN KANSAS CITY AND VICINITY.

WM. H. R. LYKINS.

The fossils of Kansas City are found in the rocks of the Upper Coal Measures of the Carboniferous system. It is not presumed that the following is a full and correct list of all our fossils, but only such of them as we have been able to identify with the means at hand; and probably a few of the names we have given will have to be corrected in the future. The march of improvement is rapidly obliterating many of our best localities, and it has been thought best to put upon record what we have found; for instance, the *Conularia crustula*, a very rare fossil in the U. C. M., has only been found in a very limited space, and that will have soon disappeared. We have also quite a number of species and varieties yet to be described and named, especially in the Cephalopoda, Fishes and Plants. The Plants we have not attempted to name, as they would require a specialist in that particular branch of palæontology. The many railroads centering here bring rock-ballast from long distances out on their roads. These rocks often contain fossils not found in this city or vicinity, and a stranger finding them and referring to our list would think we had been very careless in overlooking them. The beautiful little fossil *Syntrilasma hemiplicata* is found quite plentiful in the ballast of the A., T. & S. F. road in the city, but none has been found in place nearer than Eudora, Kansas, about twenty-five miles distant. Such fossils we have marked with an asterisk (*) when they have not been found in our local rocks. Hardly any one collection in the city will be found to contain *all* the fossils on the list but all that we have named have been found here and in the immediate vicinity.

For many of these names and identification of the fossils I am indebted to Mr. W. J. Parrish, who has one of the best local collections in the city.

PROTISTIS.—Fusilina cylindrica.

Ptychostylus heterocostalis, nov. sp. (Gurley, 1884).

RADIATA—*Crinoidæ.*—Archæocidaris, sp.

Eupachycrinus verrucosus.

" sp.

Schaphiocrinus hemisphæricus.

Zeacrinus mucrospinus.

" acanthoporus.

Corals and Bryozoans.—Axophyllum rudis.

Campophyllum torquium.

Fenestella Shumardi.

" sp.

Fistulipora nodulifera.

Lophophyllum proliferum.

Polypora submarginatum.

" sp.

Rhombopora lepidodendroides.

Syringopora multattenuata.

Synocladia biserialis.

BRACHIOPODA.—Athyris subtilita.

Chonetes granulifera.

" glabra.

" Vernuiliana.

Discina nitida.

" sp.

Hemipronites crassus.

" crenistriatus.

Isograma (chonetes) millepunctata, rare.

Lingula carbonaria?

" scotica.

Meekella striato-costata.

Orthis carbonaria.

Orbiculoides, sp.

Productus costatus.

" longispinus.

" Nebraskensis.

" Americanis.

" Prattenianus.

" punctatus.

" pertenuis.

" semireticulatus.

" symmetricus.

BRACHIOPODA.—Rhynconella, sp.
Retzia punctilifera.
Spirifer cameratus.
" lineatus.
" planoconvexus.
Spiriferina Kentuckiensis.
Terebratula bovidens.
*Syntrilasma hemiplicata.
GASTEROPODA.—Bellerophon carbonarius.
" crassus.
" Marcouianus.
" Montfortianus.
" percarinatus.
" textilitformis.
Euomphalus pernodosus.
" rugosus.
" subquadratus.
Lepetopsis Parrishi, new, (Gurley, 1884).
Loxonema multicostatum.
" rugosum.
" semicostatum.
" sp.
Machrocheilus gracilis.
" intercalaris.
" var. pulchella.
" medialis.
Murchisonia, sp.
Naticopsis Altonensis.
" var. giganteus.
" monolifera.
" nana.
" subovatus.
" ventricosus.
" Wheeleri.
Platyceras Nebraskensis.
Platyostoma Grayvillensis.
Pleurotomaria Broadheadi.
" conoides.
" depressa.
" Grayvillensis.
" Missouriensis.
" Newportensis.
" perhumerosa.
" subscalaris.

GASTEROPODA.—Pleurotomaria sphærulata.
" turbiniformis.
" tabulata.
" valvatiformis.

LAMELLIBRANCHIATA.—Astartella ?
Allorisma costata.
" granosa.
" subcuneata.
" subelegans.
Avicula longa.
Aviculopecten carboniferous.
" Coxanus.
" Hertzeri ?
" occidentalis.
" Providencis.
" neglectus.
Aviculopinna Americana.
Conocardium ? sp.
Cypricardinia carbonaria.
Entolium aviculatum.
Edmondia Aspinwallensis.
" glabra.
" Nebraskensis.
" reflexa.
" subtruncata.
Lima retifera.
Macrodon tenuistriata.
" obsoletus.
" sp.
Modiola subelliptica.
" sp.
Monopteria longispina.
" gibbosa.
" sp.
Monotis ? gregaria.
Myalina Kansasensis.
" perattenuatta.
" recurvirostris.
" subquadratus.
" Swallowii.
" sp.
Nucula ventricosta.
Nuculana bellistriata.
" *var.* attenuata.

LAMELLIBRANCHIATA.—Pinna peracuta.
Placunopsis carbonaria.
" recticardinalis.
Pleurophorus oblongus.
" tropidophorus.
" sp.
Prothyris elegans.
Pseudomonotis radialis.
" Hawni.
" *var.* sinuata.
Schizodus Curtis.
" Wheeleri.
Solenomeya radiata.
" rhomboidia.
Solenopsis ? sp.
Streblopteria tenuilineatus.
Yolda Stevensoni.
" carbonaria.

CEPHOLOPODA.—Discites Toddanus, new, (Gurley, 1884).
" sp.
Goniatites planorbiformis.
" politus.
" minimus.
Nautilus ferratus.
" occidentalis.
" Missouriensis.
" nodoso-dorsatus.
" sp.
Orthoceras aculeatum.
" cribrosum.
" sp.

PTEROPODA.—Conularia crustula.

CRUSTACEA.—Phillipsia major.
Cythere ? sp.

VERTEBRATA—*Fishes.*—Antliodus, sp.
Cladodus mortifer.
Deltodus angularis.
Helodus, sp.
Orodus, sp.
Petalodus destructor.
Peripristis semicircularis.
Xystrodus occidentalis.
Fish-spines undetermined.

PLANTÆ.—Calamites cannæformis, rare.
Cyclopteris? sp.
Neuropteris, sp.
Pecopteris, sp.

From the Lower Coal Measures at Rosedale, Kansas, four miles south of the city, the fossils are found on the dump from the bottom of the coal shaft, which is about seven hundred feet deep.

LAMELLIBRANCHIATA.—*Cardiomorpha Missouriensis.
*Aviculopecten rectileratarius.
CEPHALOPODA.—*Nautilus, sp.
*Goniatites, sp.
FISHES.—*Petrodus acutus.
*Petrodus occidentalis.
*Listracanthus hystrix.
IN THE LOESS.—Helix, sp. 2.
Pupa, sp.
Succinea, sp.
Teeth and fragments of bones of Mastodon.
Teeth and incisors of Rodents.

GEOLOGY IN GENESIS.—II.

S. H. TROWBRIDGE.

In the first part of this article attention was mainly directed to the origin and development of the inorganic portions of our earth; in this, we notice more particularly the mode of introduction of its organized beings.

The formulated expressions, "Let the earth bring forth," "Let the waters bring forth," and again, "Let the earth bring forth," impress the mind with the idea of parturition, and suggest the question whether God's plan of creation was by *fiat* or by secondary agents—whether mediate or immediate. The most absorbing question of the age, (unless, perhaps, we must except pleasure-seeking and money-making), is in regard to the origin of the thousands of living forms which have peopled and do people our earth. It may be threadbare, it may be even offensive to some, but it is the question which still perplexes the *thinking world*, and, like Banquo's ghost, will not down at their bidding. The oft-repeated formula, "after his kind," relating to the introduction of plant and animal life upon the earth, is considered by many as destructive to the development hypothesis of Darwin and others. Morris understands by it that every animal "produces its own kind and its own kind only through all the successive generations." Lyell says: "Each and every species was endowed, at the time of its creation, with the attributes and organs by which it is now distinguished." Principal Dawson claims "we are taught by this statement that plants were created each kind by

itself, and that creation was not a sort of slump-work to be perfected by the operation of a law of development, as fancied by some modern speculators." Dr. Clarke says, "Every plant and animal was *so* made as to produce its own kind through endless generations." But when he adds: "This is proof that all future generations of plants and animals have been seminally included in those which God formed at the beginning," he admits as much of the theory of evolution as its most confident supporters claim. He even out-darwins Darwin. Agassiz holds that animals of different species, and also of the same species, and even the various races of men, were separately created in many different localities.

Moses tells us plants were created on the third day, and no mention is made of any further creation of plants. The only recorded creation of aquatic animals was on the fifth day; and of land animals on the sixth day. And the record conveys to our minds the idea that the work of each day was presented for God's revision or inspection, and in each case "God saw that it was good." The works "were in weight and measure perfect and entire, lacking nothing," as Adam Clarke interprets it. We would, therefore, be led to expect no additions thereto in the future. But if geology teaches us anything, we there learn that *all* land plants by no means came into existence before aquatic animals, and that many of the latter made their first appearance after the formation of land animals. Geologists do not find land plants first or in the lowest rocks, but find marine animals and plants about the same time. But in the rocks above those containing these two forms of life, and consequently of later origin, are found remains of immense quantities of land plants. These plants are not the same as any now living. Above the strata containing ancient forms of plants are found new forms of marine life, and higher still appear still later and entirely distinct forms of both plant and animal life. Every new form coming in before or after the period devoted to creations of that particular kind of life comes in without any Bible record. Now, if on each creative day the work was made so complete as to be pronounced good, we seem driven to one or the other of two conclusions: 1. That each extended beyond the dawn of succeeding days and even to recent time, which seems to have no warrant in Scripture; or 2. That on each day God set agencies at work capable of completing the introduction of all forms and varieties of the peculiar kind of life to which that creative day was especially set apart. This points to the idea of secondary agencies or delegated powers, and leads us to suppose that at least some of God's creative acts were mediate rather than immediate.

A few years ago nearly all theologians and a large majority of geologists were believers in "special creation." But what is creation? Making out of nothing. But *how*? What do we know of God's *method* of creation? In his *word* he does not tell us except by implication, and if we ever know, this side the grave, it must be from his works. And, no doubt, the mere implication of the Bible, instead of positive statement, is designed to induce us to study nature to find out. "It is the glory of God to *conceal* a thing, but the *honor* of kings to *search out* a matter." Now looking as deeply as *we* can into this question, how do *we find*, I mean by our own observation and experience, that God created?

Does all or any of the life of which we have any present knowledge first appear full-grown, complete in form and parts, and with perfect adaptation to the ends of its mature existence? Do we not see at first only a speck, a germ, a motionless seed or egg; and do we not know that the full stature of any plant, animal or man is reached only after a more or less slow and long-continued process of development? Yet the general idea of creation has been that it must be instantaneous. Where did we get the idea? The only answer I can find is the echo —where!

The fact that God looked upon the completed work of each day, and saw that it was good somewhat reminds us of a proprietor inspecting work performed by secondary agents. If we accept the nebular hypothesis we must conclude that the members of our solar system were formed through the natural development of physical law rather than by special and immediate creation. Dr. Cocker, a strong adherent to the doctrine of divine agency in all creative work, after careful study of the original finds that the Hebrew *bara*, meaning absolute creation, occurs only three times in the first chapter of Genesis. 1st, in verse 1, referring to the creation of matter; 2d, in verse 21, to the creation of animal life; and 3d, in verse 27, to the origination of spirit-man in the image of God. These three creations of matter, life and mind, he claims are the only *creative* acts or actual *originations*. All others were *formative*, and formation supposes a something to be formed. If this be true, *vegetable* life was *formed* and was an outgrowth from pre-existing material. This may give a deeper meaning to the command. Let the *earth* bring forth plants; and *reminds* one of Tyndall's "promise and potency" of matter.

One with much experience in examining the fossil-bearing rocks of the earth's crust, can hardly fail to be convinced, if all the fossil forms which are *called* distinct species are really so, that, so far as outward form and occasional internal structure indicate relationship, many species are genetically related to each other. Any considerable collection will furnish specimens called by different names, and said by trusted authorities to be entirely distinct, found in different layers of rock, in which it would be extremly difficult to find as much difference as appears between brothers and sisters of the same family, or between leaves from the same tree. It is easy to arrange series of fossils, said to represent different species, which so run into and overlap one another in their resemblances that it would be safe to challenge any one to draw a satisfactory line of distinction between them. But this is far from proving evolution or even mediate rather than special creation. It may only argue, as I believe it does, that the term "species" is used in too restricted a sense. Till scientists and theologians can agree as to the definition of species, at least among themselves, it is idle for one to say what he does or does not believe in regard to the origin of species.

Dr. J. W. Dawson, who is doubtless the most active and most trusted champion on this side the Atlantic, of conservative views upon this subject, and who deals the most effective blows against what he calls "the modern gospel of evolution," renders "after its kind" as after its *species*, and holds that the "flora

of the third day must have had its place before the Paleozoic period of geology; also that "no plants of the older and middle geological periods now exist." "We may therefore rest assured," says he, "that the vegetable *species*, and probably also many of the generic and family forms of the vegetation of the third day, have long since perished, and *been replaced* by others suited to the changed condition of the earth." But, if each plant propagated its own species only, as he asserts, it is difficult to account for the introduction of the widely differing species which appeared later than the Paleozoic period, and replaced the "created" forms. As they could not, in his view, be developed from the first forms, there must have been creations of plants after the third day, of which we have no record in the Bible; for he allows us to conceive of no conservative way in which the old could have been replaced. And the difficulty is increased when we understand that the plaudit "good," pronounced upon the work of each day, indicates that the work was already complete. The Doctor explains his position in these words: "The introduction of new species of animals and plants has been a continuous process, not necessarily in the sense of derivation of one species from another, but in the higher sense of the continued operation of the cause or causes which introduced life at first. This, I take to be the true theological or scriptural as well as scientific idea of what we ordinarily and somewhat loosely term creation." He further remarks: "The formulæ in Genesis, 'Let the land produce and let the waters produce,' imply some sort of mediate creation through the agency of the land and the waters, but of what sort, we have no means of knowing. They include, however, the idea of the origin of the lower and humbler forms of life from material pre existing in inorganic nature." This is essentially the position of Dr. Cocker, as already shown. One more quotation from Dr. Dawson, will suffice: "The term 'evolution' need not in itself be a bugbear on theological grounds. The Bible writers would, I presume, have no objection to it if understood to mean the development of the plans of the Creator in nature."

Prof. Dana, another acknowledged and honored light on the theistic side of this controversy, asserts that a conclusion most likely to be sustained by further research is this: "The evolution of the system of life went forward through the derivation of species from species, according to natural methods not yet clearly understood, and with few occasions for supernatural intervention."

I have said this much on the mooted subject of the origin of living forms in nature, in the first place, because a thorough study of either Genesis or geology requires it, and, secondly, with a desire to show that in reality theistic students of nature hold views essentially the same as their materialistic co-laborers, *so far as the facts in nature are concerned.* The only real difference is in the *interpretation of these facts.* But here the gulf which separates them is as deep and yawning as that between the monkey and man. The one claim that all the processes of nature are due to forces *within physical nature herself*; and these, so far as their study of nature is concerned, ignore the agency of God in it. To this extent they are Godless, but it does not follow that, outside of their study of nature, they may

not believe in God and reverently worship him. Men are *too apt* to look upon this class as sole representatives of scientific thought, and all belief in evolution is condemned because of the supposed heterodoxy of this one school. The other, which embraces no inconsiderable part of the scientific world, believe in evolution *as the work of God and his method of creation.* Geology furnishes abundant evidence—though not conclusive—that God's plan of creation was by some form of evolution. Now if we are ever forced by facts revealed in nature to accept this or some other mode of creation which we had not foreseen and which is not in harmony with our previous belief and habits of thought, will it not be *God's work still?* If it be said that these changes in nature take place without any aid of Divine power, I most emphatically object. "God upholds all things by the word of his power." "All things were made *by Him*, and without Him was not anything made that was made?" But if it be said that evolution or development is God's plan of creation, I must confess that I see no reason for denial or objection and no cause for fear of the consequences. That this is or is not his plan, however, neither science nor Scripture has yet positively assured us. Whatever may have been God's method of creation, it ill becomes short-lived and short sighted man to suggest what to his mind would have been a better method of procedure.

I have used the word "day" thus far without any reference to the length of time the word is meant to indicate. Bible students and geologists now agree that the creative days were not twenty-four hours in length, but indefinite periods of time. This is one among the many instances in which a knowledge of nature has changed our interpretation of Scripture. That geology teaches this has been incidentally, though I trust sufficiently, demonstrated in the great length of time required for the stupendous changes of which there are abundant evidences in the structural history of our earth. That Scripture teaches it, is abundantly established in various ways. It is enough for our purpose merely to refer to the different senses in which the word day is used in different parts of the Bible: "One day is with the Lord as a thousand years and a thousand years as one day." "A thousand years in thy sight are but as yesterday, when it is past, and as a *watch in the night.*" It is derogatory to the infinite God to restrict him and his ways—his days of work and his day of rest—to the narrow limits of our ways and times. "As the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts." Prof. Dana has said: "A Deity working in creation, like a day-laborer, by earth-days of twenty-four hours, resting at night, is a belittling conception, and one probably never in the mind of the sacred penman." God had no need of rest after the labor of the creative days. "The Creator of the ends of the earth fainteth not, neither is weary." He simply ceased from *creative* work and now, in his long seventh day, devotes himself, so far as our earth is concerned, to works of love and mercy for the further benefit of the favored beings for whose abode he had created the earth. The creative days were "God divided days and nights in distinction from sun-divided"—(Cocker). Even in the first two chapters of Genesis we find several

senses in which the word is used. "God called the light day." This light has been shining ever since, hence *this* day is perhaps as long as time itself. "The evening and the morning were the first day." The evening was the darkness of chaos and extended from the beginning to the time light first appeared. As this time is indefinite the length of the remainder of this day is equally so. The "evening and the morning" before the appearance of the sun, and the "evening and the morning" after its appearance are alike called a day. In verse 14 the word day is used both to indicate the hours of light in the 24 hours, and also the whole 24 hours. And in the fourth verse of the following chapter the word day is used to designate the whole period of creation.

The order of succession, as shown by both the records, has received so much attention that but little more concerning it need be said. In general, we find that the order of plants and animals, as they appear in the rock formations, is strikingly in harmony with the order recorded in Genesis. Each reveals the fact that the lowest in the scale of life were mainly the first to appear; though both records, as we now interpret them, show that the gradation from the lowest to highest was not a uniform and unbroken one. It must be admitted that the record of the rocks has as yet been but imperfectly deciphered. This, however, is often admitted or denied according as one position or the other best serves the ends the party has in view, and the conclusions he wishes to reach. On the other hand, in the brief Bible record, while we are profoundly convinced that it contains the truth and nothing but the truth, and that no future discoveries in geology will make it appear any less true, it is highly probable that from a scientific standpoint, it does not contain the *whole* truth. In view of the fragmentary nature of each, the harmony is too marked to be reasonably attributed to chance, or to fail in convincing a candid student of both that the two revelations have a common author and a common purpose. With the best light to which I have found access, after considerable pains-taking research, I would say in recapitulation that the panoramic vision creation of which Moses saw, contained the following pictures, and that they are equally correct illustrations of the book of nature and the book of Genesis: After the blackness of darkness which preceded the energizing of matter, the first picture was of a light diffused through space, presenting to the inspired spectator no distinct object, but simply a glare of dazzling brightness; then he saw the solar system broken up into separate planets with clear sky between them; next the first grand upheaval of the land above the universal ocean of our own planet; then a luxuriant growth of terrestrial vegetation upon it, as in the carboniferous period of the geologist; then the appearance in full view of the sun, moon and stars; after this the land, water and air swarming with sea-monsters and reptiles of both sea and land, the bird-like reptiles, saurians, pterodactyls, etc., and the reptilian birds of the Mesozoic age; finally appear on the screen the monstrous sloths and other mammals of Cenozoic time as the megatherium, mammoth and mastodon; and lastly man appears to crown the whole.

According to geology and to Genesis, man appeared when in the fullness of

time all things had been prepared for his reception, and the earth fitted to be his happy abode. It is doubtless true, as Dana says, if the earth's history had closed in the Reptilian age we might have supposed it to be the work of a demon. But, fortunately it did *not* close then. And there is abundant evidence, both in nature and revelation, that the highest happiness of the highest inhabitant of this earth was the central thought during its whole history.

The subject of this article embraces references to the earth's history contained anywhere within the limits of the book of Genesis. There are many such allusions which we must pass unnoticed. Prominent among these are such as refer to the origin, distribution and unity of the various races of men. These suggest, for collateral information from the book of nature, the study of pre-historic man by means of the implements, utensils, earthworks, and other remains which are so widely distributed on the surface of the earth; also the tracing of the earliest wanderings, the traditions, and the physical, linguistic, and other peculiarities of existing races. The history of the flood of Noah is another item of rich geological interest; but the fewest possible words in regard to its universality are all that space will allow. This deluge was long regarded as universal, and even now it is by no means difficult to find men who suppose that the numerous strata of rocks, with their buried dead which have left their epitaphs upon their horizontal tombstones; the deposits of sand, clay, and gravel in alternating layers, and the countless evidences of erosion and displacement of material by water, are all and alike referable to the flood of Noah recorded in the Bible. To say nothing of the absurdity of the notion that fifteen or twenty miles in thickness of aqueous deposits, with their widely varying forms of plant and animal life, could be found in a single year; the want of water to submerge all the elevations of the globe; the lack of space in the ark for the thousands of animals upon the whole earth; and the improbability—if not impossibility—that the few which the ark contained could have multiplied and distributed themselves over the entire surface of the globe in the time which has transpired since the flood, have led students of geology to conclude that the Deluge extended over only those portions of the earth which were occupied by the peoples whom God had sworn to destroy. And *now* we see that the language of *Scripture* bearing on this point does not indicate universality in any stronger terms than such passages as—"every creature under heaven," "uttermost parts of the earth," "under the whole heaven," and many others, which we know from the context to refer to only a restricted portion of the earth's surface.

No one is asked to accept what is here for brevity's sake suggested rather than said, solely on the author's *ipse dixit*; nor should any reject it simply because hitherto he may have thought differently. Whether these views be considered tenable or not, if they may induce others to pursue a similar line of inquiry, I think such will agree that the study of the two records side by side is not only delightfully fascinating and exalting, but is the best, if not the *only* way to fully understand either.

COAL IN KANSAS FOR 1883.

I make a few extracts from the report of E. A. Scammon, State Inspector of Mines, which has just been published:

It has been a considerable task to get from some operators a statement of mine productions; while many have been prompt and business like, yet there are a few to whom I have made two and sometimes three visits for information, which could have been obtained in a few minutes if only attended to. However, the matter is now well understood and in the future much less time will be consumed in gathering material for these reports, This report has the merit of being correct and reliable, which will in a measure compensate for lateness. It embraces the coal production of the state for the last half of 1883; the number of miners employed in the mines, and outside laborers engaged in preparing the mine products for market; makes a calculation of the amount of coal mined by each miner in the six months; also the amount per day for each miner, allowing 150 working days in the time.

This average of coal mined per each miner is not entirely correct, from the fact that it is based on the number of miners at work in November and December, two months of usually active work in the mines, and the number of miners is larger in these two months than a general average of the whole six months taken together, hence the larger number of men for same quantity of coal, the lighter production per each man.

In Osage County there are eighty-four shafts (five are stopes, but are here, for brevity, considered same as shafts) located as follows: Osage City and vicinity, 33; Peterton, 5; Dragoon, 3; Burlingame, 12; Scranton. 17; Carbondale, 14. Of this number ten are worked out or abandoned, and in the month of December twelve were not operating, leaving sixty-two in operation, quite a number of these working but a few men. The shafts are all operated by horse power. Bushels of coal mined in Osage County, 4,722,367; number of miners, 1,518; mine bosses and weighers, 127. This distinction of men is made because miners are paid by the bushel, the mine bosses and other employes by the day or month. Amount of coal mined per each miner, 3,110 bushels; per day each miner, allowing 150 working days, 21 bushels; amount of money paid miners, $330,500; per miner, $317. Mining bosses and laborers not included; just actual diggers paid above amounts. Had the demand for coal been good, and mining active, the business would have been easily one-third larger, and these figures correspondingly increased.

In addition to above amount of coal, there was stripped coal in the vicinity of Scranton and Carbondale, 707,153 bushels; ninety teams and 120 men stripped coal.

Thus, in Osage County output of coal for last six months of 1883, 5,429,520 bushels. Miners employed, 1,564; laborers and strippers 201; total 1,765. This does not include operators, superintendents, office men, etc.

The coal mines of Cherokee and Crawford Counties are generally considered one coal district; the mines being located in the northern part of Cherokee and southern part of Crawford Counties, they are properly enough considered one district, and in this report I combine the two counties and give the business and output as one district.

There are twenty-five shafts, two of which are stopes; of these, all but two are in operation. Located north of Columbus, 4; Newcastle, 1; Stilson, 1; Scammonville, 4; Weir City, 8; Pittsburg, 5; Litchfield, 2. Of these, fourteen are operated by steam power, and eleven by horse power. Output of coal, 5,796,877 bushels; number of miners, 817; pit bosses and employes, 215; amount mined per each miner, 7,095 bushels per each miner daily, allowing 150 working days, 47 bushels; amount paid miners, $217,000; each miner, $265. The average amount of coal mined by each miner appears small, but this calculation is made from the number of miners at work in November, which is larger than an aver- of six months would be. The business here would have been one-third larger had the demand warranted it, Stripped coal in this district, 235,000 bushels, employing 35 teams and 60 men. Total output in the district, 6,031 877 bushels; number actual miners, 835; engineers, laborers and strippers, 277; total 1,112 —operators, superintendents and office men not included.

Leavenworth County, 953,099 bushels. Number of miners, 200; other employes 162; total 362. Penitentiary shaft, 504,064 bushels. Number miners (convicts), 131; laborers 15; total 146.

There are several smaller mining districts in the State from which I have partial returns and some I have none. The reports I have I combine in the following statement from Ellsworth, Russell, Neosho, Franklin, Bourbon, and Linn Counties: Number of bushels of coal mined, 458,715; number miners, 103; number laborers, 16.

From the foregoing, the total amount of coal mined in the State of Kansas for the last six months in 1883 was, in bushels, 13, 377,875; in tons, 535,115. Number miners, 2,844; other employes, 671; total, 3, 504.—*Correspondent Kansas City Journal.*

PHYSICS.

TISSANDIER'S ELECTRIC BALLOON.[1]

I. W. COOK.

Aërial ascents were scarcely ever spoken of by classical writers, but are alluded to in one or two fables written before the dark ages. In one of these we

1 Read before Penn College Scientific Association, Oskaloosa, Iowa, May 10, 1884.

have the account of a man and his son who wished to flee from an enraged king. Accordingly, they made wings of feathers stuck together with wax. The son, regardless of the warnings of his father, flew so high that the heat from the sun melted the wax. Thus deprived of his support he fell into the sea and was drowned. We have another account of a flying dove made of wood, but neither is authentic.

It is evident from history and other sources that the ancients considered it beyond man's natural powers to fly. It was regarded second only to the power of Jupiter to flash the lightning and hurl the thunderbolt. Such attempts were made generally by the lower class of projectors who possessed a little ingenuity and a smattering of mechanics.

In 1600 an Italian constructed a set of wings of various plumage and undertook to fly from the walls of Stirling Castle to France. But he fell very shortly to the ground. He gave as a reason of his sudden descent the fact that some of the feathers he had used were from birds that flew close to the earth.

One Borelli proved positively in a work issued 1680, the impossibility of man by his muscular strength, to be able to give motion to wings of sufficient extent to keep him suspended in the air. Although this fact be true, yet it does not make it impossible to have a flying chariot with power produced by machinery, or a boat so constructed that it will sail in the atmosphere. Even before it was clearly proved that men could not fly as birds such attempts were made, though in a very rough manner. It was nothing but ignorance of the nature and force of the atmosphere, as well as the properties of all aërial bodies, that caused so long a time to elapse before the invention of the balloon.

The first who comprehended, though in a very vague and erroneous manner, the principles on which a body might be made to float in the air was a monk, Albert of Saxony. In 1670, Francis Laua presented a still more rational view of the subject, which though useless, as it was not practical, yet introduced sound principles, which could be said of no earlier attempt. His idea was to have four copper balls twenty-five feet in diameter and one two hundred and twenty-fifth of an inch in thickness, attached to the four corners of a square basket and exhausted of air, and thus obtain an ascending force of twelve hundred pounds. But balls constructed in this manner would not even bear their own weight, much less the immense pressure of the atmosphere from the outside. In 1783, the real balloon was discovered by James and Stephen Montgolfier. They got their idea from watching the clouds. They noticed that they were suspended in the air, and thought if they could get enough of some such material in a captive state it would ascend. They filled small sacks with smoke, and found sure enough the smoke, or something else given off by the fire, did ascend and take the sack with it. Accordingly they made a linen bag one hundred and five feet in circumference and filled it with smoke from a straw fire. It rose to a great height, and descended in ten minutes, one and one-half miles distant.

The news of this ascension spread rapidly all over Europe. The excitement was so great that a collection was taken up in Paris, for the purpose of having the

the experiment repeated. The construction of a second balloon was undertaken by two brothers of the name of Roberts, assisted by a prominent Professor of Paris. It was made of silk, varnished with a solution of elastic gum. It was thirteen feet in diameter, and filled with hydrogen gas. As it took some time to inflate it, bulletins were issued daily regarding the progress. Near the time for ascension so many people had gathered that a detachment of soldiers had to be called to keep them back. August 27, 1783, at 5 P. M. a cannon was fired as a signal for the ascent. Upon being liberated it rose very rapidly about three thousand feet. At this time it began to rain quite hard, but the rain had no effect, neither on the balloon nor the spectators. Thousands of well dressed people, many of them ladies, stood exposed watching it. It remained in the air about 45 minutes and came down fifteen miles distant.

About this time the Montgolfier brothers repeated their experiment in the presence of the King and Queen, as well as many other spectators. Suspended below this balloon was a cage containing a sheep, a chicken and a goose, which are the first of the animal kingdom recorded as having ascended in this manner. The balloon, cage and contents descended safely in eight minutes, having reached a height of 1,500 feet.

The largest balloon on record was 100 feet in diameter and 130 feet high. It ascended in 1784, having been inflatec over a straw fire in seventeen minutes. Seven persons were in the car. It rose 3,000 feet, and descended in fifteen minutes.

Hundreds of balloons have ascended since the Montgolfier brothers sent up their linen sack filled with smoke, and as many have been the devices employed for their improvement or to render them controllable. Tissandier's electric balloon seems to reach nearest the desired end. Tissandier claims that we should look upon the atmosphere as a vast ocean and a balloon as a boat so constructed that when launched far above all obstructions it can be propelled and guided through the air by a screw propeller and by a rudder in a manner similar to the way our screw propellers are moved and guided in the water. In accordance with their views they constructed (October of last year) their celebrated electric balloon. It consists of three distinct apartments; the air balloon, properly so called, a gas apartment for inflating, and the electric motor to give motion, that is, horizontally, by means of a screw propeller. This balloon is much greater in length than in thickness, having a length of twenty-eight metres and a thickness of nine and two-tenths metres through the middle, thus being almost cigar shaped. Its capacity is 1060 cubic metres. The netting over the balloon is made of ribbons, woven with longitudinal spindles which keep them in their proper geometrical positions. These make the outside surface much smoother than when cords are used. It is connected on the sides of the balloon with two flexible shafts, which perfectly conform to its shape when inflated. The car is in the shape of a cage made of bamboo rods strengthened by cords or threads of copper covered with gutta percha. It is attached to the ribbon net-work by ropes. The arrangement for guiding is a rudder a broad surface of unvarnished silk supported by bamboo

poles. This rudder is attached near one end to the under side of the body of the balloon, and so arranged that it is perfectly under the control of the operator.

The screw consists of two spirally curved paddles made of silk and bamboo poles, the deformation of which is guarded against by the action of coils of steel wire. Four batteries are so constructed and placed in the car that this screw can be given four different motions, varying from sixty to one hundred and eighty revolutions per minute.

The summer of 1883 was almost gone when the balloon was completed; therefore, it was given but one trial last year. This trial was made by Tissander and his brother. They began inflating it with hydrogen gas about eight o'clock in the morning and continued till half past two in the afternoon. At twenty minutes past three they made the ascent. On the ground there was almost no wind; but, as frequently happens, it increased with the altitude. On this account they did not let it rise more than four or five hundred metres. About four o'clock in the afternoon they made a very successful descent. The balloon was left inflated over night, as they expected to make another trial the next day, but on account of the coldness of the night the bicromate of potassium in the tanks had crystallized and the battery, which was by no means exhausted, was on this account, however, incapable of action. They were able in their last year's ascent, by the use of the screw, to stand still against a strong wind, and when drifting with the wind by a slow motion of the screw a much greater speed could be obtained than that caused by the wind. They could also maintain any desired angle with the direction of the wind by the use of the rudder. However, they found that when holding the balloon in a position at right angles to the direction of the wind the rudder became inflated like a sail and a series of gyratory motions before noticed became more violent. From this they conclude that the balloon should not be held in a position at right angles to the direction of the wind.

These brothers, as well as many others, feel sure that successful aerial navigation will soon be no more a thing of the future, but of the present. They consider this first ascent as merely a preliminary trial which will soon be repeated with the alterations which their experience commands.

HISTORY.

THE CONSPIRACY OF BARRERA—A REMINISCENCE OF THE EARLY HISTORY OF MISSOURI.

OSCAR W. COLLETT, CUSTODIAN MUSEUM, MISSOURI HISTORICAL SOCIETY.

In 1761 the king of France made a gift of Louisiana to Spain. The gift was accepted with reluctance, as its advantages were questionable, indirect at best,

and it was certain to occasion an annual expenditure of money largely in excess of any income it could possibly yield. The Spaniard, accustomed at all times to move slowly, in the present instance was in no haste to assume an onerous burden; and accordingly it was in the spring of 1766 only that Antonio de Ulloa, the newly appointed Spanish governor, arrived at New Orleans to take possession.

It had been agreed between the two courts that the French troops in the province, about 300 in number, should, if needed, serve under Spain for the time being; and it not being convenient just then to the Spanish king to send a sufficient force to the colony, Ulloa brought with him but two companies, ninety men all told, counting upon the garrison actually in Louisiana to make up what was necessary to the proper military equipment of the new government. But immediately after his arrival he found to his great surprise that notwithstanding what had been determined between the two kings, and the instruction to M. Aubry, the French commandant, to place his troops at the disposal of Spain's representative for such period as he should require, the French soldiery refused positively to enter the Spanish service, as their term of enlistment had expired. The new comers, therefore, could not take formal possession.

Under these circumstances it was agreed between Aubry and Ulloa that they would conduct the government conjointly as though the country belonged to Spain, the former to continue in command, but subject to the directions of Ulloa, until the arrival of the expected Spanish troops. The machinery of government thus devised was put into operation immediately, France ceased to supply funds, the entire expenses of the colony were at once assumed by the Spanish ruler, all public functionaries, ecclesiastical, civil, and military, thenceforward were paid their stipends and salaries out of the Spanish exchequer, and the French officers in charge of the several districts solicited and obtained from Ulloa the continuation of their commands.

Ulloa deemed it advisable to establish four new posts, as the English had built several on their side of the Mississippi, which he did with the approval of Aubry, and distributed among them his ninety men. One of the four was built at the mouth of the Missouri, probably on the same spot where La Salle camped in 1682 on his voyage of exploration, and named Fort St. Charles. It was a stockade fortification, of ample dimensions, with bastions, defended by five guns two of six and three of four pound calibre, besides small arms in abundance, and swivels for use as occasion required. The ammunition consisted of 126 cannon shot, 66 canisters of grape, quantities of lead bullets, and a large supply of powder. It was to be the storehouse of the goods sent up for distribution among the Indian tribes that were expected to visit St. Louis periodically as they had formerly visited Fort Chartres; and besides serving as a place of refuge in case of need, to guard the entrance to the Missouri river against interlopers from the English side, as well as unlicensed traders of Louisiana. Its garrison consisted of twenty men and some employes, mechanics and others who were not soldiers,

commanded in 1767 by Captain Francisco Riu. It may have been established in 1766, but not later than the summer of the year following.

After surrendering Fort Chartres to the English, on October 10, 1765, St. Ange, the French District Commandant, in obedience to orders had removed the remainder of his troop to St. Louis, which village was in the district of the Illinois, the seat of whose government had hitherto been at the Fort, and was in command when Riu's expedition arrived.

These strongholds were not intended to supersede the French establishments already in existence, and Fort St. Charles and its commander left St. Ange free to direct affairs as formerly, except as to the Indian trade, which was regulated by Riu. He issued the permits to traders and distributed the presents which Spain, in continuation of the French custom, provided for the Indian nations, through Milony Duralde, who had been sent up with the Spanish expedition as engineer and inspector of works. St. Ange and Riu were on the best of terms, and the Spaniard appears to have resided in the village.

St. Louis, as yet, did not produce sufficient food for its own wants, and the garrison of Fort St. Charles was dependent for its chief supply of provisions upon St. Genevieve. In November 1767, by order of M. Riu, an armed boat was dispatched from the Fort to St. Louis, in command of Sergeant John Gaillard, with one Paul Barrera, store-keeper of the post, on board, freighted with four thousand pounds of powder and goods for the Indians, with instructions to land the cargo at the village, proceed to St. Genevieve and bring up a return load of flour, salt, meat and corn, for the winter's supply of the establishment at the mouth of the Missouri. The boat arrived, delivered the goods to Duralde and the powder to Laclede for storage in his magazine; departed for St. Genevieve, procured what was needed and reached the village on December 2d, at mid-day.

Mischief had been brewing, probably concocted at Fort St. Charles some time previous, in which Paul Barrera, the store-keeper was the ring leader, and needed but a pretext to break out in open revolt. Soon after he landed the Sergeant reported to M. Riu, and was ordered to hold his men in readiness to resume the voyage in the morning. Next day a villager brought word to the Spanish commandant that Barrera was sick and could not leave, and had taken a room with one Marie in order to be treated medically. M. Riu therefore sent a message to Barrera to the effect that he had behaved improperly in not making known his illness yesterday afternoon; that if he was really sick he could remain three or four days, otherwise he must embark and return to his post, and requested an answer in writing. Receiving none, he sent again, when he was informed that the storekeeper had called in Surgeon Condé Meanwhile a violent north wind had risen and rendered navigation unsafe. M. Riu therefore deemed it prudent to put off the departure of his men for the day.

Early next morning, December 4th, the Spanish commandant sent word to the storekeeper by M. Duralde, to take his departure unless sick, as the King was not served by the troop remaining idle at St. Louis with the boat; and besides, it was a disadvantage to the Fort. The official replied that he felt much

better, and after dinner would come and see M. Riu; but as his answer gave no assurance of his intention as to departure, the commandant directed the sergeant to repeat the message. Presently the sergeant returned, evidently under the influence of drink, with word from the storekeeper that he felt much better, but had given himself over to the devil in hell; and the Sergeant having objected to carry such a message to his superior officer, Barrera had replied: "Tell him just what I said."

M. Riu reprimanded the Sergeant for not having come to him for the orders of the day, and for leaving for St. Genevieve without passport or instructions. The sergeant asked pardon for these irregularities and was forgiven. He then went on to say that yesterday he had issued orders to the troop to hold themselves in readiness for the morrow; but they declared they would not leave in the morning, and that he might obey M. Riu, but they would not; furthermore, that while at St. Genevieve, Gomez and Gousman, two of the soldiers, had refused to assist in loading or to work. Mr. Riu replied that he should put his statement in writing; which he did on the spot.

M. Riu then directed him to go once more to the storekeeper and ascertain whether it was his intention to embark, and to report in writing. Thereupon the sergeant answered, excitedly, that he would not, as his word was sufficient, adding that M. Riu was a false man, a two-faced man; that he demanded to know every thing, and, notwithstanding he had been fully informed, he required things to be put into writing that he might entrap and ruin him. M. Riu asked why he used such language, told him to contain himself and not to speak so excitedly and so loud; but he all the more spoke out, saying, he wished every one to hear his words, that what he had said was said, and M. Riu could make of it what he liked. As notwithstanding the Spanish commandant's patient forbearance, and efforts to persuade him to calm himself the sergeant only persisted in his unseemly language and conduct, he bade him go and take the orders of the storekeeper, since he disregarded those of his superior officer. At this Gaillard left, declaring he would compel by force the storekeeper to go on board.

M. Riu went immediately to the government chamber to communicate what had occurred, and consult St. Ange as to what was best to be done. The French official's quarters were in the central hall of the Maxent, Laclede & Co. factory, which seems to have been built specially with a view to accommodate the district government when it should be transferred to St. Louis from Fort Chartres, situated on the west side of Main Street, between Market and Walnut Streets, from which there was a full view of the river; and his soldiers' barracks were in the basement. They agreed to send for Barrera, which was done. One and the other pointed out to him his duty, and urged him to an effort to allay the excitement of the detachment, for both perceived that affairs were taking a serious turn; and, finally, M. Riu commanded him, in the name of the King, to take his departure for Fort St. Charles. To all of which the storekeeper only made answer that he was sick, and the king did not require that a sick person should set out on a journey; but if he must go, it would be only on a written order in

which it should be specified that he was ill at the time. M. Riu said that he would send for the surgeon who had attended him. Dr. Condé came immediately. He had been called in by Barrera, who complained of sickness, of suffering from oppession of the chest, and asked to be bled; and as the patient insisted he had bled him accordingly; but there was no symptom whatever of fever. After this statement the storekeeper left the chamber, saying he would get ready to embark, meanwhile St. Ange had quietly given orders to his entire troop to assemble in the barrack-room.

Half an hour later there came a negro servant of the Spanish Captain to say that five or six soldiers were at his house, and wished to see him; but both commandants thought it better that the soldiers should come to the Government Hall, and the negro was directed to notify them accordingly. Fearing that insult and personal violence to M. Riu was intended, St. Ange ordered de Belestre to put the French guard under arms immediately, and station them in an adjoining room with instructions to be ready to act at a moment's warning. The command was obeyed on the spot as the guard was within call. The Spanish soldiers having come, for prudential reasons only three were admitted, and the others required to remain outside on the steps. After various remarks Fereco, the spokesman of the trio, asked who commanded the boat, the sergeant, or the storekeeper? On being informed it was the sergeant, after some words had passed, he said, the boat should not leave to-day, and that when it did the storekeeper must be on board, as he had started with it from the mouth of the Missouri. He proceeded to say further that neither he nor his comrades were willing to acknowledge M. Riu as their commander, or obey his orders, and that they would not have or recognize any one as their superior officer, except Lieutenant Ferdinando Gomez. After further disrespectful remarks and insubordinate conduct, the three left the chamber, and all six started for the boat to take their departure for Fort St. Charles, as St. Ange and M. Riu supposed.

Not a great while afterwards, the two commandants, still together in the council chamber, were startled by the discharge of a swivel. Montardy was immediately dispatched for the storekeeper. He found him already in the boat and two soldiers holding him by the collar. He notified Sergeant and Barrera that St. Ange wished to see them, but the former replied that the soldiers would not allow the storekeeper to go ashore. One Boyer, who had come up with the Spanish expedition as an employe and been substituted for another when the detachment left Fort St. Charles, was standing on the bank near the stone to which the vessel was moored. He was ordered to cast off the rope and come aboard immediately; and before Montardy could run up the hill to the government house St. Ange and M. Riu, who had come out and were standing on the steps, saw the boat push out into the river, turn her prow down stream, and the crew shouting "to the city," "to New Orleans," and discharging their guns, whose balls rattling against the cabins alarmed the villagers, begin to row lustily with the current.

As was reported by Boyer, who subsequently made his escape, some nine or

ten soldiers had conspired against M. Riu, and plotted schemes of which he knew nothing, not having been taken into their confidence. As the hour of setting out was late in the afternoon the consirators determined to camp for the night below the mouth of the Meramec. On the route Barrera said to his companions: "My friends, we must not separate. If you abandon me I will dash out my brains or drown myself." The soldiers answered that they would not desert him. The storekeeper continued: "We must go to Pensacola. If on the voyage to the city a French detachment sent in pursuit should overtake us and attempt our arrest, we must defend ourselves, and perish rather than be taken; and further, that he would kill or drown himself sooner than surrender; that M. Riu wished to ruin them; and it was better to perish as one man or to save themselves altogether." Upon this the soldiers promised to stand by him and by each other to the last extremity. Boyer further learned from their conversation that they had at first intended going up the Beautiful River, but not being acquainted with those parts had changed their destination for Pensacola.

The conspirators having arrived at St. Genevieve, the storekeeper wished to unload half the flour, but his companions objected. Barrera, the Sergeant and two soldiers went ashore to visit Mr. Vallè. Presently those who remained in the boat, whether they really intended what they said, or merely wished to get rid of him and afford him an opportunity to take himself off, ordered Boyer to go up to the top of the hill and keep a lookout for pursuers in case there were any, which he did. Finding himself at some distance from the landing and out of sight of his companions, and having been there for some time, Boyer began to turn in his mind the enterprise in which Barrera and the soldiers had embarked, and that they would be lost and probably pay the forfeit of their lives for their revolt, and concluded he had better get himself out of their company, lest he should share their fate. So, full of these disquieting thoughts, he furtively withdrew further from the river, plunged into the forest, made his way back to St. Louis, reported himself to M. Riu, gave an account of what had occurred while he was on the vessel and how he had escaped, not omitting to mention that he had lost all his little effects which were in a sack in the locker in the bow of the boat.

What finally became of Barrera and his fellow conspirators still remains among the secrets of the past; but their revolt and flight must have been known in New Orleans very soon after their arrival, as M. Riu had a boat armed, and dispatched immediately to the governor of the province with a full report of what had occurred.

To complete this hitherto unwritten, and somewhat romantic chapter of local history, we proceed to tell what happened to M. Riu during the remainder of his stay in Missouri. But that the narrative may be better understood, it will be necessary to go back a few years. In 1763, M. d'Abbadie, then commandant of the province of Louisiana, granted Maxent, Laclede & Co. the exclusive trade of the Upper Mississippi and Missouri rivers. This monopoly caused a great outcry among the New Orleans merchants; and on their remonstrance the French minister annulled the grant in 1765. Maxent, who had become a warm

friend of Ulloa, induced the Spanish governor to re-instate the company in the privileges it had lost, which he did in 1766. Riu, as we have already seen, regulated the Indian trade at St. Louis, and of course, as in duty bound, enforced the odious Maxent, Laclede & Co. monopoly in their interest. Naturally Laclede and all who were influenced by the company he represented were favorable to Riu. St. Ange, although in the service of Spain, happily for himself, was not required to take part on either side. As all the independent traders and the merchants who furnished their supplies were cut off by the monopoly, they became hostile to Ulloa, and those on the spot to Riu especially. Incited by the wrongs to which they were subjected, at one time a number of inhabitants and traders assembled and addressed a passionate remonstrance to St. Ange against the restrictive policy which was being enforced, and set forth the ruin with which they were threatened. With the rare tact which had ever characterized his conduct, St. Ange managed to pacify them with the assurance that their complaints should be forwarded to New Orleans, where no doubt they would receive attention.

Meanwhile the Autumn of 1768 had come, revolutionary proceedings at New Orleans taken place, and in consequence, Ulloa had left the province on November 1st. With his departure the Maxent, Laclede & Co. monopoly and other Spanish restrictions on trade disappeared, and also the occasion of complaint against M. Riu in St. Louis. On the eve of departure, Ulloa had agreed with M. Aubry that the four posts should be evacuated, his force replaced by French soldiers, and the Spanish troops sent to Havana.

News of what had occurred at New Orleans reached St. Louis in due season; but winter disappeared, the spring of 1769 came and passed, summer set in, still Riu and his little garrison tarried, the solitary representatives of Spanish power in Louisiana. Why should they leave? Spain, which regarded the loss of great interests with indifference, but not insults and contumelies, was sure to return in her might, and they could well bide the arrival of the coming avenger. The Spanish and French commandants on good terms, Riu spending most of his time in the village, his friends of the late Maxent & Co. monopoly owing him much good will, the traders no longer interfered with, harboring no grudge, his little garrison at Fort St. Charles an advantage to a country so sparsely populated, there seemed to be reason for his going. Besides, St. Louis was not implicated in the revolution at New Orleans; and St. Ange was far too prudent to allow himself to be made an accomplice, whatever the plausible Lafreuiere might say, or the wily Foucault write in favor of their conspiracy; and he knew too, how hostile Aubry was to all that had been done to Ulloa. He was ready to take charge of the fort when the Spaniard was ready to deliver it, for this was his duty; but for the rest he was determined to keep clear of all entanglements. Any how, it was only in the latter part of July that Labuxiere, the notary, and an officer and a few soldiers went up to the mouth of the Missouri, the first to make an inventory of the fort for the military authorities, the others to receive and hold possession. Spain's proud banner was slowly lowered, taken from the

mast and reverently folded, a little flotilla manned by the garrison cast off its moorings, discharged a farewell gun, and quietly dropped down to St. Louis. After a short delay to bring aboard a few things and to take leave, Riu got into his boat, the vessels shoved out into the stream, saluted the village with a volley, and soon were lost to sight. Doubtless the Spaniards left no unkind feelings behind.

The flotilla was in no haste to make a quick voyage; and ere it reached its destination it was met by a fast-speeding dispatch-boat with the Spanish colors flying, which communicated the joyful intelligence that Count O'Reilly with three thousand troops of the line, amid the roar of guns, and the rattle of musketry, and the shouts of many voices, had landed at New Orleans, and re-established the authority of Spain in Louisiana. From that day until the cession of the country to the United States, the flag of Spain on the shores of the Mississippi attested her absolute domination over the west half the valley. Fort St. Charles was dismantled by the Spaniards, the timber of which it was constructed soon decayed, successive floods left their deposits where it once stood, and in the course of years not a vestige remained—its memory is preserved only in history.

ST. LOUIS, MISSOURI, 1884.

THE GROWING POWER OF THE REPUBLIC OF CHILE.

Chile is in name and in an important sense a republic, and yet its government is an oligarchy. Suffrage is restricted to those male citizens who are registered, who are twenty-five years old if unmarried and twenty-one if married, and who can read and write; and there is also a stringent property qualification.

The population of Chile doubled between 1843 and 1875; the quantity of land brought under tillage was quadrupled; copper mines were discovered, and so worked that Chile became the chief copper-producing country in the world; some of the silver mines rivaled the Comstock lode; more than one thousand miles of railroad were built; a foreign export trade of $31,695,039 was reported in 1878; and two powerful iron-clads, which were destined to play a most important part in Chilean affairs, were built in England. Meanwhile, the constitution was officially interpreted so as to guarantee religious toleration, and the political power of the Roman Catholic priesthood diminished. Almost everything good, except home manufactures and popular education, flourished. The development of the nation in these years was on a wonderful scale for a South American State, and the contrast between Chile and Peru was peculiarly striking. Comparative purity and strength of race, born out of hardship and producing political stability and honesty and personal courage, seemed to be the prime factors in the Chilean distinction. And yet the two peoples were the descendants of the same European race and of kindred Indian races. Doubtless the difference in climate was entirely favorable to Chile.—*July Atlantic.*

ENGINEERING.

THE SEWERAGE OF KANSAS CITY.

G. W. PEARSONS, C. E.

In the January number of the REVIEW appeared the report of a lecture by Mr. O. Chanute, C. E., upon the sewerage of Kansas City. Another paper in the February number gave a concise description of the Memphis sewers, which are upon the "Separate system" advocated in Mr. Chanute's paper.

This important subject has attracted the attention of engineers elsewhere. *Engineering News* of New York republished Mr. Chanute's paper in its issue of the 19th of February, together with a note from the author inviting criticism, and the invitation thus given was taken up by Mr. R. Moore, C. E., ex-Sewer Commissioner of St. Louis, who on the 12th of March read before the Engineers' Club of that city a paper in review of Mr. Chanute's lecture.

The latter was present on that occasion and made a verbal reply, which he was requested to write out by a vote of the club, and both the review and the reply were published in the "Journal of the Association of Engineering Societies" for March, 1884, and subsequently republished in *Engineering News* (April 26th, May 3d and 10th).

This led to further discussion. Mr. Allen D. Conover, of Madison, Wis., wrote to *Engineering News* concerning the point made by Mr. Moore as to the obstruction to traffic by water in cross-gutters, and was replied to by Mr. C. E. Chandler, of Norwich, Conn.

Two additional papers on the same subject were read before the Civil Engineer's Club, of St. Louis, on the 7th of May by Mr. R. Moore, C. E., and Mr. R. E. McMatt, C. E., and these have also been published in *Engineering News* together with a letter from Mc. J. H. Humphreys, C. E., of Memphis, and also one from the writer, so that it is evident that there is no lack of interest in the subject among engineers.

As the people of Kansas City are, after all, the most vitally interested in this subject, it is hoped that a review of the arguments will command their attention. The articles which have appeared in the pages of the REVIEW do not need more than mention here, those which have appeared elsewhere need for these pages a fuller transcription, but the limits of this article will prevent more than an outline of their arguments being given, with a view to deduce from them and other data some general ideas of what may be best here.

First. What is the difference between the combined and separate systems of sewerage?

The earliest use of sewers in modern times was for the carrying of storm-

water. The use of them for carrying domestic waste is comparatively recent and the carrying of storm-water and household waste together, is known as the combined system.

The separate system of sewerage leaves the storm-water sewers to do the work for which they were originally intended, and provides separate sewers for household waste. These are very much smaller than those used in the combined system, and are provided with means of cleansing, periodically, by flushing with water. Mr. Moore argues that as storm-water sewers must be built, it is unnecessary to duplicate them with smaller sewers, that the history of sewerage does not bear out the claims of superior sanitary conditions in the separate system, and that instead of being an economy it would result in a final expense greater than that of the combined system. Cites the example of Croydon, England, the health of Memphis, and gives a distance of 1,000 feet as the limit that may be allowed for water to run in surface-gutters before being carried below the surface; these will be taken up later. In a subsequent paper he makes a proportion of one mile of storm-water sewers to two miles of the separate system, but it is not entirely clear whether it is to be taken as meaning that one mile of storm-water sewer would be required for a district containing two miles of other sewers or whether they should be counted as three miles, each doing its share of the whole.

In Mr. Moore's citation of Croydon he states that six-inch and four-inch sewers were replaced with larger sizes, and the ventilation improved, greatly improving the sanitary condition of the city, and infers that the improvements since made in ventilation, and flushing by means of automatic flush-tanks, are not of so great importance as to constitute a valid claim to its being a new system. He also considers that Mr. Chanute's claim that the sanitary condition of Memphis is greatly improved by the system of sewerage adopted, is not well founded.

As to the first, so many cities, both here and in Europe, are adopting the distinctive system known as the Waring separate system, that it would seem that the many engineers who have these works in hand could hardly be mistaken in ascribing the credit of it to Mr. Waring, and especially when the city of Paris, after a year's study by the best scientists and engineers of France, deliberately adopted the system, called him to make the initial experiment, and have since called on him for plans for some seventy miles of additional sewers. If a congress of European engineers, after mature study, unite in giving Mr. Waring credit for great and valuable improvements, it would seem that his countrymen might also afford to give him what credit may justly be his due—for so far as the bugbear of his patents and royalties are concerned, they do not amount to a tithe of the economy which can be attained by their use. And in a country whose mechanical and engineering achievements have been largely due to the character of our patent laws, these ought not to be a barrier to taking up anything that promises economy and improvement.

With regard to the sanitary condition of Memphis, the writer spent a year or more there, leaving just as the yellow fever broke out, has visited the city several

time since the sewerage system was inaugurated, examined its workings, conferred with the authorities and leading citizens, and considers that Mr. Chanute's claims are fully justified. That city has for some years been growing nearly as fast as this, and it is greatly due to the feeling of safety from epidemic diseases which the improved sanitary condition of the city has given.

Regarding the passing of storm-water under ground, Mr. Moore considers 1,000 feet (from the crest of the water-shed) as the maximum distance that it should be allowed on the surface. As water runs slower and accumulates more on flat than on steep grades, using this as an average we would have from two to five blocks from the crest of the water shed in which it is unnecessary to construct storm-water sewers. Mr. Conover, of Madison, Wisconsin, considers the nuisance of storm water much less than Mr. Moore does, and the experience of the writer in Memphis, being in the streets very much of the time for a year or more, in all weathers, is similar.

The City of Baltimore with 322,000 inhabitants has but eleven miles of storm-water sewers, and the city engineer deems that but few more are necessary. Mr. Moore cites complaints from other city officials to show that this sewerage is very inadequate, but it seems that this is partly from the imperfect character of the sewers as well as the small amount. No advocate of the separate system would expect to provide storm-water sewerage at so small a rate as a mile to 30,000 inhabitants. To reach all the lots in an average city as is needed for domestic service, needs practically about the same amount of sewers as of water or gas mains, averaging perhaps about a mile to each 1,000 inhabitants—less in densely populated districts, more in those of less density.

This city, as stated by Mr. Chanute, from its peculiar topography will be more like a number of small towns than one continuous city in its requirements for sewers. It follows from this that the amount of sewerage per capita will be greater than in a more regular topography, and it is correspondingly more important that the best and most economical system be devised. Mr. Chanute in this makes incidentally a strong point in that he says many engineers do not realize that storm-water sewers are not needed everywhere.

With regard to cleanliness of streets, so far as the experience of the writer extends, it bears out Mr. Chanute's claim that the best sewered cities are not the cleanest. Memphis without storm-sewers is very noticeably cleaner than this. Our clay is but partly carried into our sewers by our occasional storms, and it is very doubtful whether what is carried into them does not entail more expense than it would be to cart it off, without having to bail it out of the catch-basins.

This naturally brings us to the consideration of the value of these and the office they are supposed to perform in keeping noxious exhalations out of the streets.

In passing through different portions of the city the writer has noticed in cold weather the frosty air coming out of these catch-basins; showing that the traps had become so far emptied as to unseal them, and an average of these was found to be about four out of ten. It may be questioned whether four catch-

basins out of ten are not enough to let all the exhalations that the sewers can make escape, and whether the four persons taking these in, would not rather the other six should share with them; in such things we are often very unselfish.

With regard to the noxious character of these exhalations both writers and smellers are divided; all, however, agree in not calling for more.

The quicker sewage can be disposed of, the less will it affect the public. The small sewers do this, for their smaller size gives a quicker flow and leaves less margin for the accumulation of material to decompose. When the sewage has acquired considerable volume it will be less liable to such accumulation in large sewers, and accordingly the use of the combined system will be less objectionable the nearer we approach the outlet.

This leads to a consideration of cost and size. The combined system of sewerage has cost an average per mile of $30,146 in St. Louis, $25,000 in Brooklyn, $34,550 in Providence, $20,727 in this city. The separate system has cost in Memphis $6,875 per mile. An estimate for the city of Baltimore gives $10,000 per mile. In Leavenworth the work so far has cost about $8,800 per mile, including the main trunk sewer. This will be reduced by the extension of laterals, which cost an average of about $6,000 per mile, including flush-tanks and royalty. Such data are modified by local circumstances. It occurs in most cities that natural water courses are closed in, and while they greatly increase the cost of sewerage, they give value to the ground with which the sewer is not credited; it also occurs that large sewers are built to form trunks for future extensions, the result of which when made would be to reduce the average cost materially. It would be a fairer exhibit of comparative cost to compare the systems simply by the actual cost of the sizes of sewers required for each.

In considering this, but little stress has been given to the difference in rainfall in different localities. In England, where the combined system may be considered as having its best growth, rains are frequent and the storms comparatively light; in London the record of three years showed 746 rainy days, and on only four days did rain fall to the depth of one inch in twenty-four hours. Here we have months at a time without rain, and then storms of great severity;—as much as three inches of rain having fallen in one hour, and a rainfall of two inches or more per hour being so frequent that it is necessary to take cognizance of it in our sewer construction.

The sewerage of Brooklyn during its heaviest flow is estimated at one one-hundredth of an inch per hour for the whole area of the city. In fourteen years the record shows ten storms of one-half inch per hour, and ten more between that and two inches, one of over two inches, and one of over three inches.

An usual practice in American cities has been to provide for the sewers carrying one-half inch per hour, and the few storms giving more than this amount to the sewers would seem to justify that provision.

Late experience in Brooklyn and other eastern cities, however, shows that this is inadequate, and the result of heavy storms has been the flooding of low

L. of C.

areas with the sewage from higher ground to such an extent as to cause serious damage to, and depreciation in the value of property so situated.

Some of the more recent sewerage work in the East has provided for the admission of one inch of rain per hour to the sewers, and if we would avoid damage to property, for which the city may become responsible, it will be necessary to make even greater provision than that; in fact, some of our storms carry water to the sewers at the rate of fully two inches per hour, or two hundred times the amount of the heaviest sewerage proper. With regard to the amount of storm-water sewerage required it will vary greatly in different localities, being the greatest in the low lying lands where it is necessary on account of slight grades to have larger sewers and carry them nearer to the margin of the watershed.

An area of some two hundred acres in the low land of West Kansas City has two sewers, measuring with their branches, some 11,000 feet, draining some 300 lots and leaving some 700 to be yet provided for, which would increase the sewerage in this district to some 20,000 feet, of which about 5,000 feet is necessary as storm-water sewer.

In a district of some 140 acres, partly drained by the Broadway sewer, there are now some 18,000 feet of sewerage, draining some 400 lots, and leaving some 200 yet to be provided for; the amount of storm-water sewerage required in this district is about one-fifth of the whole.

These areas are perhaps as different from each other as any in the city, and indicate that of all the sewerage required, from one-fourth to one-fifth may be considered as necessary for storm-water, and that the remaining three-fourths or four-fifths may be built on such plans as may be considered best.

These storm-water sewers being in the lower part of the district, it would be most natural to consider them as the trunks of the sewer system, and the advocates of the combined system can find good reasons for claiming that they should be so used; if used to this comparatively small extent their size can be afforded ample for full efficiency, and the other sewers using them for an outlet would help to keep them so clear that they will be as inoffensive as such sewers can well be made.

This would give the remainder of the area to the separate system, avoid the objection of building duplicate sewers, make an unquestionable economy, and perhaps reconcile the views of the advocates of the different systems as nearly as it can be expected that they will be.

As an example illustrating this proposition we will assume an area of 300 acres in which no sewers are yet built, and that to reach all the property in the district will require six miles of sewers of which one and one-half are needed for storm-water.

One and one-half miles of storm-water sewers .	$ 36,000
Four and one-half miles of small sewers	26,000
Total	62,000
Against six miles of combined sewers	120,000

saving nearly one-half of the whole expense, and very great modifications of these data will be needed to prevent a large economy from being realized.

SOCIOLOGY.

SOCIAL SCIENCE IN KANSAS CITY.

The Social Science Club of Kansas and Western Missouri met in this city on May 9th and 10th. There were 109 members present, the various cities of this vicinity being represented as follows: Leavenworth twenty-eight, Kansas City twenty-five, Wyandotte nineteen, Topeka sixteen, Lawrence twelve, Atchison nine.

The reception committee consisted of Mrs. E. H. Allen, Mrs. Kersey Coates, Mrs. P. D. Ridenour, Mrs. H. W. Baker, Mrs. Wood, Mrs. T. H. Kennedy and Mrs. J. C. Horton. Mrs. Coates delivered an appropriate address of welcome, which was responded to by Mrs. Geo. A. Banks of Lawrence. The annual address was delivered by Mrs. C. H. Cushing, President of the club, after which papers were read by Mrs. Elizabeth Mayo of Leavenworth on "Water as a Cinder, a Solvent and a Healer," followed by a general discussion; Mrs. T. M. Kennedy of Kansas City upon "The Ice Age;" a poem of greeting by Mrs. David Patton of Atchison; "Living Issues in Social Science," by Miss E. P. Newcomb of Kansas City; "Education outside the School Room," by Mrs. Dr. W. Jones of Sedalia, Mo.; "Character a Growth," by Mrs. H. E. Monroe of Atchison; "Culture for Women," by Mrs. S. M. Ford of this city; "Entertaining," Miss Lula Dunn of Lawrence, "Physical Education of Women," Dr. F. M. W. Jackson of Emporia; "Mendelssohn," Mrs. C. F. Runcie; "Divorce, Its Results to Women;" Mrs. Ella H. Kingsley of Paola. All of these papers were of a high order of style, ability and appropriateness, and should be published in permanent form. We select as a fair sample of the whole the following paper by Mrs. Dr. Wm. Jones, of Sedalia, upon

"EDUCATION OUTSIDE THE SCHOOL ROOM:"

It was Edmund Burke that said "Education is the cheap defense of nations," and perhaps we cannot find any one who does not recognize the fact that education in the broadest sense of the term, both in the common school and in the higher realm of culture, is essential to the maintenance of an advanced civilization and requisite to the intellectual and moral progress of the race. No thoughtful person can doubt the fact that the best arrangement of public affairs, the highest attainment of moral culture and the purest state of social life are dependent upon the thoroughness and universatility of education. The beneficent Creator has bestowed on man mental and moral faculties. He has graciously endowed

him with social qualities which may be trained to grand and noble purposes. Reason and revelation enjoin upon man the obligation to cultivate for noble uses these God-given powers. The capacity developed and the direction given to these is what is implied by the term education. But it is true that much the largest proportion of mental and moral training received by each member of society comes through exterior channels. Man is unconsciously educated by that which is daily transpiring around him. As the rocks and pebbles polish each other by contact in the flood, so men affect each other, and character is moulded by personal influence in the rushing tide of life. Coming within the circle of these ever operative forces, we see that the process of training that we call education goes forward much more rapidly out of school than under the care of the professor. Prominent among the agencies that make up the sum total of the educating forces is the social influence of the home. As a rule the life receives its outline and general direction before the pupil enters the public school. Education begins with life. The sense of touch first ministers to the infantile training; afterward the sight, then the hearing. The senses are the guides leading the van in the progress of nature. We necessarily begin with present and tangible things. Afterward we give absent things a visible form by picture, and this meeting the eye, is described and impresses the mind through the sense of hearing. Thus, before we are conscious that the child is affected by surroundings, the foundations of character are laid.

"The real seed corn whence our republic sprung was the Christian households which stepped forth from the cabin of the Mayflower, or which set up the family altar of the Hollander and the Huguenot on Manhattan Island or in the sunny south." The best characters, the best legislation, the best institutions were cradled in such homes. Immediately in connection with the home are other social influences that operate continuously as teachers. There are groups of children in the alleys and on the commons, the natural product of the saloons, a vicious and neglected element, being educated rapidly for evil. In a few years they will control the elections and re-enact the shameful scenes so recently perpetrated in Cincinnati.

The religious and secular press are agencies of great power, wielding a mightier influence on the public conscience and the character than the schools. The poet Browning says:

> " But mightiest of the mighty means
> On which the arm of progress leans,
> Man's noblest mission to advance,
> His woes assuage, his weal enhance,
> His rights enforce, his wrongs redresss,
> Mightiest of mighty is the press."

How shall we speak of this enginery for good or evil, this resistless force that day and night moves on with ever increasing power, enlarging its sphere and intensifying its importance as an educator? Through the press religion, liberty and law are made effective in fitting men for noble deeds. But by the same

agency, plagues worse than those that destroyed the land of the Pharaohs are diffused over society, poisoning the pure fountain of public and private virtue. Cowper says:

> "Thou fountain at which drink the good and wise,
> Thou ever bubbling spring of endless lies,
> Like Eden's dread probation tree,
> Knowledge of good and evil comes from thee."

War and commerce are educating forces, and although intimately related, each has its distinctive features. The varied lessons of war cannot be analyzed, the subtle influence cannot be measured; it is beyond the reach of all chemical solvents known to the world; it breaks up all existing forms of thought and compels society to take on new ideas and clothe itself in new attire. War does not always educate aright, When its power is sought for perpetuating despotism, for oppressing the toiling millions of earth, it awakens no holy aspirations; it develops the lowest and darkest passion of the soul; it puts out the light of home, and settles like the shadows of death upon the crushed and blighted sons of men. But when war is necessary for the purpose of guarding freedom's holy altars and defending the honor of home and preserving beneficent institutions for those who shall live in coming years, it takes on a brighter hue and its educational powers are exerted along other lines; if it inaugurates political convulsions, these, like geological upheavals, usher in new epochs in the world's history that indicate its rapid growth, for the public mind that is indifferent to the arguments of a statesman is educated quickly and thoroughly by the events that are the sequences of a defensive war.

So far as we can judge from the view we can get of the subject, the Divine mind contemplated this earth as the sphere of man's noblest activities, and in providing for his progress, for the discipline of his moral faculties and for his intellectual nature, He so constructed the earth that commerce should become a science, and, that while it should administer to man's physical wants, it should at the same time contribute to the adornment and development of his mental and moral being. In order that man might not fail of this, He distributed with a lavish hand the gold and silver in the crevices of the mountains. He set the sturdy oak and the pine in the Northern forests. He gave the cotton and the corn to the rich valleys of the South and West. He filled the caverns or the earth with coal and oil, and deposited the pearls and gems in the depth of the sea. So, that while in every land there are the staples and the luxuries, an exchange of commodities is a necessity, and while the American fills his home with the productions of foreign lands, the streets of the cities of ancient learning and wealth are lighted from the oil wells of his native land. The desire for wealth has always been a spur to human exertion and the possession of wealth has been and ever must be a source of power to the individual and the state. Gold is the sinews of war and the amount of gold possessed by any nation is the measure of its

material value. Before the rise of commerce the only intercourse nations held with each other was that of warfare.

"There were then only two sources of wealth, agriculture and pillage." "Cyrus led the Persian armies to the rich provinces of Asia for the express purpose of plunder." "The Romans who were then masters of the world arrogated to themselves all treasures." Having heard of the fabulous riches of one of the kings of Egypt, "they passed a law by which they constituted themselves the heirs of a living monarch and confiscated the dominion of an ally." Such was the state of the world when commerce began its career. It entered the arena as an educator, it laid its fashioning hand on every department of life, it transformed hostile nations into admiring and devoted friends and bound them together in their efforts to subdue the earth and make it yield up its treasures to the will of man. Although it did not abolish war, it showed the highway to the golden age by developing new industries and making attractive and possible the arts of peace. Commerce began to manifest its powers a thousand years before the Christian era. It originated among the Phœnicians and, although subjected to many adverse influences and suffering many reverses, it has steadily gained in extent, power and influence, and at the present time it is in a great measure shaping the policy of all nations and projecting enterprises which cheer the hearts and brighten the homes of millions of the human race.

But there are two prime factors in the education of the masses, two agencies that in a larger and more general sense contribute to the education outside of the school room; the lecture platform and the pulpit. These are educating forces in the strictest sense of the term. The lecture platform of this age is a modification of the ancient forum. The orators of Rome and Greece were the educators of the people. But the form of society in which we live gives to the platform a wide range and more extended influence.

Committees on special subjects, boards of health, trustees of benevolent institutions, legislative bodies, and almost every conceivable variety of deliberative assemblies meet and discuss questions of commerce, education, social reform and political economy, and while this form of society remains, the lecture platform must always be an agency for the instruction of the people, voicing alike the grandest thought of the scientific man and the orator who directs the thought of the common citizen in the ordinary affairs of life. While the pulpit does not cover so wide a range of topics as the platform, is not possessed of the almost limitless variety, it is more forceful, in manner more definite and impressive than any other method of instruction. From the days when Ezra, the scribe, "stood upon a pulpit of wood and read the law" to the present time, the pulpit has been a definite and authoritative means of instruction. It is not an institution which may lose its influence in the lapse of years. Since the days of Jesus the forums of Greece and Rome have perished or have been superseded by the modern lecture platform, while the pulpit has multiplied itself and more nearly controls the public conscience than any single influence, and perhaps excels all other agencies outside the schools.

But in this brief estimate of educating forces we cannot overlook the exalted and refining power of music and art, nor reject their contributions to the culture and happiness of the human race.

The meaning of song goes deep into the heart. No one can express in a logical form the effect music has on man. It is a form of unfathomable speech, warming the soul for heroic deeds. According to a fable, Orpheus was presented with a lyre by his father, who taught him to play upon it. He attained such a skill that nothing could withstand the charm of his music. Men and wild animals thronged round him entranced, the trees crowded about him and the rocks softened under the magic of his notes. His wife dying, he followed her into the realms of Pluto and there sang his woes so pathetically that the ghosts wept. Tantalus forgot his thirst, the fairies shed tears and Pluto consented to restore his lost wife.

However much of fancy there may be in this, music forms the universal language which, when all other tongues were confounded, was left unchanged amid the babbling multitude. All nations can sing together when they cannot understand each other so as to converse. Music is the inarticulate speech of the heart, and cannot be compressed into words, because it is infinite. And this universal teacher teaches kings and peasant, and puts its polishing hand upon the farmer's son and the statesman. It is our inspiration to patriotism, philanthropy and religion, an agent more effectual than the instruction of the professor, in shaping the character and destiny of nations and men.

Intimately related to music is art, a wonderful teacher; also a perpetual force in character building, an inspiration to the student to seek a more intimate acquaintance with his own powers. "Art is the enduring record of man's purest conceptions in tones universally and forever intelligible."

However broad the scholarship, art improves the taste, refines and polishes the manners, and gives the luster and brilliancy to all other attainments. Art establishes a holy communion between man and nature. Ruskin says: "Man is not a child of nature like a hare. That nature is worse to man than a stepmother, persecuting him to the death if he does not return to the realm of art where he belongs." The gallery of art runs back through the ages of the world's life, and has gathered the finest conceptions of the finite mind. Within the golden gates of this temple the canvas and the stone are full of vitality and intense with expression. Along the polished walls of this temple are hung the masterpieces of the great artists. Along its lengthened corridors architecture has inscribed her name and lent her loveliness for its pillar and canopy. In her gorgeous aisles the sculptured marble stands radiant with grace and beauty, and from the canvas and the stone the mind catches the divine outline, the fair ideal of a perfect life. The productions of pencil, brush and chisel, the frescoes, the carved work and painting of the ancient temple and modern gallery are the silent teachers of the coming ages, the high ideals toward which each new generation aspires.

EDUCATION.

COMMENCEMENT AT THE KANSAS UNIVERSITY.

Among the numerous exercises and addresses at Lawrence during commencement week, none seemed to make a more profound impression than the address of President John Bascom, LL. D., of the University of Wiseonsin before the literary societies, on the evening of June 2d, upon the subject:

"WHAT THE MEMBERS OF A STATE UNIVERSITY OWE TO THE STATE."

Dr. Bascom spoke for an hour and a half on this subject and during the entire time held the rapt attention of his audience, great thoughts seeming to start out from every word. The following imperfect synopsis of the lecture gives but a faint idea of the great strength and character of the discourse:

"The American people are a practical people. They do things well. Our danger lies where our power lies. The workers have the highway and they who do not belong to this class must look out for themselves. The American proverb is "Look out for no one." The practical and theoretical belong practically to the same thing. We are to remember that the present is for the future and the future grows out of the present. The theorist may be full of ideas, but loses their use. The statesman is both a theorist and a practical man. The American is never afraid to have a tilt with political science. He never wakes up until immediately confronted by great danger. We were thus confronted with the rebellion. Theory and practice when each is true to itself must meet at some time. The man of theories and book learning must not be avoided. He has that which we must outlive, but through which we must pass. The subject of the lecture is "What do the members of a State university owe to the State?" Justice and claims are commensurable. Justice is rooted in the right of men to command me. Benevolence is the right or power to control myself. "What do we, as men, owe to men?" You of the university owe gratitude to the State for the great advantages of education. It is wrong for one worthless man to lean on the man of a useful and prosperous life. The State by its just sense of generosity gives it to you for the advancement of the best interests of the public. There is no broader obligation than that under which the State has laid you by its action. The higher institution must care for the lower ones. If the limbs and trunk of a tree be lopped off the roots will perish. Our university should be supported by all the lower institutions of education and protect them as well. A higher education is too little cared for in our country. The State may educate because it can educate, and because it is beneficial to its citizens. We do not fall into such errors when other things are in danger. As to his property when this is the case, he is

only too ready to conscript his neighbor as a recruit to the army to protect his property. Education should be free and full and humanitarian. That is a disagreeable one who is a man of mere practicality. Take care of that man and the man will take care of himself, and if there is anything worth doing he will see it and do it. To save only that we may save more is true conservatism. To move foward, to grow, is the true course. The second duty you owe to the State is to stand with it and for it. It is the duty of the educated to winnow the wheat and to let none but the good seed go back to the soil. Politics is a sin against the soundness and integrity of human speech. It is an illustration of the saying "every fellow for himself and the devil take the hindmost." The accumulation of great wealth in a short time is an appropriation of the public finances, brought about by the peculiar state of our institutions, and he who accumulates does not render commensurate service. The common welfare is to be the dominant idea, but it is not now the fact with us. The query ought to be, "Who ought to be made to pay taxes?" not as it is now, "Who can be made to pay the taxes?" "Vanderbilt and Gould have been more successful, not more selfish. But this power of great accumulation should he made impossible. True liberty stands for productive power. The sale of intoxicating drinks undermines more of the liberties, hopes and happiness of the people than almost anything else."

The speaker then turned his attention for a few moments to the press, and his words are given verbatim: "Never has the public press been so active, so influential as now. Yet its abuse of power in this country passes all estimate. It substitutes enterprise in gathering and circulating news for real intelligence, and puts smartness of repartee in place of sound principle. Its destructive characteristic is mendacious personality. Let every man for himself modify this statement, general in character, by the exceptions which it calls for, yet these being made how many papers among the thousands of papers in our land would any one of us be willing to bring forward and present to a high minded, fair minded, but thorough critic as good types of wise, able and beneficial journalism. The moment an item of interest finds its way into a journal it flies all over the states with only the slightest attention to its truth, or to the injury it is likely to do. One might as well ask the winds that fling dust in his eyes in the street to be a little more considerate, as to ask our daily press, rushing through every highway and byway like a whirlwind, to be more careful in sweeping upward and onward the perversions and misrepresentations that choke the air; it ought at least to check our omnivorous appetite for news to reflect that if we include minor errors in detail and false coloring, the larger part of what we call news is false, is often moral malaria scattered from the festering centers of human life. True, well ordered responsible journalism, a medium of clear, sound and efficient ideas, is still a dreamed-of blessing, that approaches but slowly and from a great distance. Here also, young men and young women, you should carry correction to this eager, succulent, evanescent journalism, of which we have so long had our fill. Law is is tempered with too much chicanery and needs the refreshing influence of new blood."

The philistinism of American society was briefly and pointedly treated by the doctor with his sharp, caustic language, cutting sharply and mercilessly the weak points in our artificial society. At this point Dr. Bascom paid his respects to Chicago in this manner: "The visit of Matthew Arnold has brought the tendency of philistinism of American society clearly to our minds. It is hard for a man to apreciate a man like Matthew Arnold; hard for them to make the allowances this great critic calls for, hard for them to relish and digest the truths he offers. This was very distincly seen a short time since in the action of Chicago. The mere shadow of Arnold fell on its streets and every dog, big and little, rushed before the public and emptied his canine impatience and petulance into the air. Lo the shadow proved to be not even a shadow, but a stuffed image, donated on fool's day by the more tranquil and self contained city of New York. The weary dogs had nothing to do but to retire, each to his own yard and meditate on the surprisingly illusory character of the world and the things in it. It is said that irritability under criticism is a promising sign. If so there is a good deal of promise to Chicago. It is not easy to justly estimate so typical and prodigious a piece of Americanism as is Chicago, so full of open and latent evil, so rich in the possibilities of good. One thinks of the chant of the three witches, and these three witches were avarice, appetite and vain show.

"Double, double, toil and trouble,
Fire burn and cauldron bubble."

The address was one of the most able ever heard in the University hall. The members of the societies congratulate themselves on their success in securing so excellent a lecturer as President Bascom.—*Cor. Kansas City Journal.*

COMMENCEMENT AT WASHBURN COLLEGE, TOPEKA, KANSAS.

"THE FANATIC."[1]

Of late the public thought has been turned to consider the lives of men who in their day were held by very many to be wild visionaries. For fifty years Wendell Phillips was contemned by a large body of his countrymen as an erratic, unbalanced teacher of ultra views, while the name of John Brown flamed luridly on the sky as a fanatic.

No age conspicuous for daring innovation, for profound upheavals of established order, for heroic advancement, has been wanting in men whose voices rose shrill and clear above the confused din of every-day life, proclaiming like rapt prophets theories and demands which sounded in the ears of their contemporaries as babel cries of men bereft of reason. In periods of great civic distress or peril warnings have rung in the air from seers believed to be pale with frenzy or deluded with bewildering fantasy. With what derision did the priests of Baal and Ashtaroth look upon the grim and hoary prophet challenging them on

1 An address by Judge Solon O. Thacher.

Carmel's height to mortal combat, and to determine by the lightning of the skies which worshiped the true God. Hebrew history in all its course lifts on high these weird characters, separated from all their surroundings by claims and pretensions denied or scouted by men of their own time. Their foreboding and entreaty were alike unavailing, since they were received as coming from men moved by disturbed and unhinged minds.

Emerson, I think it is, says that the heresy of yesterday becomes the literature of to-day. When too late the awakened Trojans recalled the wild prophecies of the frenzied Cassandra. Because a man's neighbors call him an enthusiast or a fanatic, a benefactor or a demon, it does not follow that he is such. When the man's picture is finally placed in the long gallery of time, the mellow historic light falling upon it at a proper angle, then we can say whether it is the face of a malevolent zealot or of a devoted lover of his race. The veiled prophet of Khorassan, sneering at the delusion of his followers, we know was a fiend behind his snowy robe and shining visor:

> "So shall they build me altars in their zeal,
> Where knaves shall minister and fools shall kneel;
> Where Faith may mutter o'er her mystic spell,
> Written in blood—and bigotry may swell
> The sail he spreads for heaven with blasts from hell."

There are conceptions of good or evil in some natures that so outrun their age that the mass of people, unable to rise to their summit or sink to their depth, pronounce the proclaimer thereof a fanatic. Then, again, it happens that a man's contemporaries may have full faith in his power and seership, and blindly follow his impassioned voice, but a later and calmer age beholds in him only a fanatic. The Crusades, whose gigantic movements not only convulsed the world, but whose disasters and ignominious failure at the last wrought out for civilization and the emancipation of thought the most stupendous results, so far as Peter, the hermit, is concerned, were the product of a strange and misguided religious frenzy. Yet to monarch and peasant, to warriors and children, to thoughtful monk and chivalric cavalier, he seemed to preach a duty and a pleasure, enjoined by the holiest of sentiments.

> "Great wits to madness are near allied,
> And thin partitions do their bounds divide."

If, however, we more attentively consider the modern use of the name, "fanatic," we find that it has been so played upon by the valiant and radiant lives of so many heroes who have been proud to wear the despised appellation, that much of its olden dismal features have faded into lines of awe and beauty. The fortune of other odious and dishonoring designations in becoming transformed into names of honor and worth, has in some degree fallen upon this word, which once condensed into itself ignorance, fatality and superstition. The men who have gloried in being stigmatized as fanatics, who have been serene amid ostra-

cism and persecution, who have been lifted high above storm and cloud by the faith that inspired them, and who have left names

"At whose sight all the stars
Hide their diminished heads."

possessed some general qualities worth our while to note. They were men of genius rather than men of talent.

Of all the distinctions I have seen drawn between genius and talent, I prefer that of De Quincey. In his essay on Keats he thus distinguishes: "Genius is that mode of intellectual power which moves in alliance with the genial nature, that is with the capacities of pleasure and pain, whereas talent has no vestige of such alliance. Genius is the language which interprets the synthesis of the human spirit with the human intellects, each acting through the other, while talent speaks only from the insulated intellect. And hence also, it is that besides its relation to enjoyment and suffering, genius always implies a deeper relation to virtue and vice; whereas talent has no shadow of a relation to moral qualities, any more than it has to vital sensibilities. A man of the highest talent is often obtuse and below the ordinary standard of men in his feelings; but no man of genius can unyoke himself from the society of moral perceptions that are brighter and sensibilities that are more tremulous than those of men in general."

Another writer condenses the argument in these words: "Nature is the master of talent; genius is the master of nature."

I speak now only of the fanatic whose genius allied him to human welfare and ennoblement. Many men have gone singing to the pyre for conscience sake, many have passed into the whelming waves of persecution, obloquy and death for a fanatical faith; exile has borne into the snows of Siberia true hearted men who cherished thoughts hostile to despotic sway; and in all ages clans, tribes and whole peoples have suffered the loss of home, substance, and even life, for fidelity to beliefs called by their destroyers fanatical—all these, indeed, bear "a good report" amid the voices of history, and their loyalty to conviction remains a range of lighted headlands along the coast of time; they are a part of that universal teacher we call human experience. But now and then among these unsung and inconspicuous martyrs there rises a majestic form, an awful presence, which rivets our gaze and concentrates our wonder. He heralds a mighty epoch —he embodies the aspirations of the unknown and nameless multitudes. The sorrows of his dumb and stricken fellows have touched his soul to a tension and exaltation only possible to a few. Of self he has no care; the planning and plotting, the vacillation and deviousness of the man of mere talent governed only by ambition, have no dominion over him. He follows, as only a man of genius can, an ideal immeasurably above his day; he pursues through defeat and shame a bright and, to him, ever alluring hope whose ultimate realization he undoubtedly cherishes, and whose consummation he devoutly trusts will bring happiness to mankind.

Back of deeds lie thoughts, and beyond thoughts are feelings, emotions.

Knowledge is a bleak, dark shadow against the upper air until there rises above its crest the fiery column of the glowing lava and the flame-lit vapors of intense emotion. When out-reaching thought is vivified and illumined by a profound belief in the imminence and guidance of supernatural control, at once there moves into historic light and grandeur a central figure, and often a fanatic whose record is the story of his age.

Who could bring before us Athens without recounting the marvelous life and philosophy, the gracious yet despised teaching of Socrates. He drank the fatal cup of hemlock because beyond his day he beheld a more perfect way of life for the Athenian youth than the chosen beliefs and rites of their ancestors. Gibbon, cold and agnostic, cannot touch a single phase of that vast empire, whose decline and fall he so majestically recites, without, amid all his cynicism and unbelief, halting spellbound and amazed, to wonder at the inexplicable hold possessed by the life and words of the humble Nazarene, dying in obloquy an abhorred death, over the legions of Cæsar, the favorites of the royal palace, the students of the colleges, and the hordes swarming from Northern woods and snows over the plains of the Po, Adige and Tiber.

The most illustrious character in all history, save one, is that citizen of Tarsus who, standing with clanking chain before imperial rulers, clad in gold and purple, pleaded for the acceptance of an obscure faith, whose outcome would immeasureably bless the world, with such pathos and intellectual power that he seemed to one governor a madman and to the other the revelator of a divine religion. The widest acquirements of wisdom and philosophy of that day were found among the porches of the academies and the groves of scholars in Athens, that city of ancient art and wealth. Standing in the shadow of that temple of Minerva, whose statue, frieze and decorations were the work of Phidias, Paul delivered a plea for Monotheism and its great human representative which, even in its fragmentary form, has excited the wonder of the orator, the imagination of the poet, and the homage of the believer. In the annals of time there is no more impressive illustration of the majestic bravery of transcendent genius than this contemned Hebrew from the rostrum where Pericles had spoken, philosophers argued, and bards chanted sweetest lays, proclaiming to learned and acute professors, teachers and logicians, his unshaken faith in the resurrection of the dead, and leading his auditors up to this new and strange doctrine by irresistible appeals to the vague yearnings of their own poets and the mute sentiments of their own altar builders. Or, if there be a more marvelous scene, it is this same man at a later day, pale with prison damps and darkness, with manacled limbs, unmoved by a double court and royalty, recounting before Festus and Agrippa and Queen Bernice, the noonday light that bewildered him as he rode along the mountain crest above the white spires of Damascus, the heavenly vision he there beheld, and the divine mission then given him, which ever after was to master and impel his life. And yet, doubtless, the large majority of the men whom Paul addressed at Jerusalem, or in the cities of the Mediterranean and at Rome, as they turned away from his fervid utterances, exclaimed, What a gifted, learned fanatic! The

creed he then proclaimed, so visionary and fanciful to that generation, is to-day the cherished hope of the world.

A further analysis of the fanaticism that has happily affected human destiny, reveals the quality of resolute tenacity. In all the realm of action what victories have followed the man who knew how to cling to his purpose! What obstacles have yielded to his defiant will? "There is no difficulty to him that wills." Repulse gives him strength. Advance tightens his lips. The unexpected finds him prepared. Over the disaster he flies the banner of hope. Beyond the hour, whether it be cruel with tempests or flaming with light, he beholds enthroned the object of his desires, and toward it he presses with unswerving resolution.

The dreamer of Bedford jail saw poor Pilgrim diverted from his noble path by a pleasant arbor on the slope of an arduous hill, and all along his journey images of delight and visages of despair intimidated or allured him. Not as the man whose life when spent passes from an erratic and meteoric course into the steady and benign radiance of a fixed star. The good he would do, the benevolence he would create, so absorbed and overpowered all other tendencies that temptation rarely assailed and never overcame his dominant desire.

Longfellow exclaims:

"O, Palissy, within thy breast
Burned the hot fever of unrest;
Thine was the prophet's vision, thine
The exultation, the divine
Insanity of noble minds
That never falters nor abates,
But labors and endures and waits,
Till all it hath forseen it finds,
Or what it cannot find, creates."

Genius without this "tendency to persevere" is certain to fail. It runs well for a season, but anon it falls out by the way.

The man who never forgets a benefit, how he is loved! The most ignoble mind admires fidelity—friendship. The world pays homage to the man who clings to a friend. It despises him who measures his action to another by the sordid reflection, "How will this affect my future?" He who profits by another's baseness, yet mutters to himself the old saying' "I love the treason, I loathe the traitor." There are no passages in history so repulsive as those which bring before us the betrayal of a friend or patron by the ambitious or insincere man. The "Art thou in health, my brother," of Joab, the dagger of Brutus, the kiss of Judas, the gilded treachery of Marlborough, the unholy revenge of Arnold, with what aversion does the historian and poet dwell upon them.

This quality of endurance illumines the good cause with radiance, and even when it touches a bad one it evokes a degree of wonder. Such is the effect of the picture Milton limns of Satan drawing himself above the fiery billows and resting his "unblest feet" on land that ever "burned with solid fire," there to

resume his eternal war and strife with Omnipotence. He who is true to a friend or a noble principle—who never swerves when the hour is darkest, but out of trouble and impending disaster gathers new hope and energy, inspired as it were to fresh acts of devotion and valor, gains universal plaudits. No man would deliberately prefer wealth or fame to the joy and peace of constant, long-enduring friends, for the one may take to itself the wings of the morning and fly away, and the other is that which a breath has made and a breath can destroy, but a true friend draws nearer to you as your eyes are blinded by the blasts of misfortune, and his constancy and cheer increase with the depth of your need or sorrow. And this same element of persistence adds intensity and horror to enmity.

The man in whose bosom there is no sunshine, but who dwells with relentless broodings over his revenge, and follows without a shadow of tiring his bitter resolve, fills us with nameless terror. The man who never forgives an injury, how he is dreaded! Out of this tenacity of purpose all the world's heroic deeds have sprung, and the want of it has brought to nothing magnificent conceptions and boundless hopes.

Historians debate about the integrity and the aim of that impressive man whose history tells that of his age, Cromwell, but none disparage the resolute purpose with which he drilled undisciplined plowmen until they were able at Marston Moor to shatter the brilliant squadrons of Rupert, and which at last placed the farmer of Huntingdon on the throne of England and made his voice a terror in the secret council chambers of royalty from Madrid to Moscow. When the poet tells us:

> "Some men are born great, some achieve greatness,
> And some have greatness thrust upon them,"

he must mean to describe mere station, position, or rank, and not nobility of soul, inherent greatness, for that alone is achieved, never inherited or received as a guerdon or reward. It has never been found disassociated from invincible purpose. Whether we search the tumultuous and stormy field of action or inspect the sequestered vale of life, wherever we see a man to whose accomplishments our souls pay the homage due greatness, we there behold one whose nature contained the fibre of unrelenting purpose.

What mountains are laid low, what valleys are raised, what crooked places are made straight to make a highway for the feet of the man of inflexible will? Of Cæsar it was said by Cicero: "Quod vult, valde vult," what he willed, he greatly willed. Whoever wills greatly stirs the world's destiny, but whether for good or ill depends finally on the ideal he follows, the motive that impels him. This it is that illumines and tranforms genius and resolution into immortal action. The more exalted the inspiration the more visionary the man often appears to his compeers.

It may be true, as Emerson says: "Nature never sends a great man into the planet without confiding the secret to another soul," for there is a kinship

among royal minds: but compared to the populace the members of the royal family are few. The man of lofty aims is thus described by Meredith:

"The man is great and he alone,
Who serves a greatness not his own,
For neither praise nor pelf;
Content to know and be unknown;
Whole in himself."

It is quite the thing, nowadays, among certain men of brilliance to decry the influence of the supernatural either in the past or in the present. But did ever a man make a deep impress in the historic page who was not filled with the thought of his own subordination to superior power?

Socrates felt the monitions of an inner voice he could not disobey. Mahomet listened to a mysterious influence he called destiny. Cromwell believed that his life was under the irresistible impulse of the Divine Spirit. Napoleon thought of a fateful star that stood over his cradle and had followed his course ever since. Von Moltke said that at the battle of Mars Le Tour defeat was changed to glorious victory by an unbidden breath blowing the silver trumpet which sounded the command to charge to the royal guard. The Maid of Orleans heard heavenly voices, amid the forests and field of Domremy, bidding her lead the armies of France until the rightful king should secure the consecrated crown at Rheims. The sacred retreat of Valley Forge witnessed the prayers of Washington. In the darkest hours of the Republic a divine light streamed into the closet of the long-suffering Lincoln. John Brown implicitly believed he was called of God to free by forcible interposition the bondsmen of the South, and this thought guided him from the slave cabins of Missouri to the frowning arsenal of Harper's Ferry and the ghastly scaffold of Charlestown.

To-day a man of this Cromwellian mould draws the attention of the civilized world as he attempts, among the sands and torrid heats of the Upper Nile, to show the barbaric tribes and frenzied hordes the exalted justice and kindness of a Christian nation. The life of Gen. Charles Gordon is one of those strange revelations which now and then call men away from doubt and agnosticism to the verities and faiths of an old-time trust in an imminent and ever present Providence. He is a Havelock in military ability, bravery and daring, and a more than Havelock in his belief in the constant guidance of all his deeds by the Unseen Spirit. Cold, hard men look with amazement upon the inexplicable career of the man who was a hero in the Crimea, disdainful of wealth, tender of the poor, sagacious and daring in danger, and as humble and faithful to the inner light as Bunyan or Loyola. The blending of sweet and gentle charities with stern martial deeds is a rare thing in history. The power to awe men into obedience and yet to hold them by the ties of devotion, is an uncommon sight. Charles Gordon transformed Chinese rebels, subjugated by his prowess, into faithful body guards, and over Soudan he throws the protection of an intrepid soul, confident of its divine mission and inspiration. Declare as we may that the man is deluded,

that his faith is the product of a diseased, ill balanced intellect, yet the fact remains that not a stain sullies his bright career, and that if it is a chimera, a will-o'-the wisp that draws him forward, it has led him into a life noble, self-sacrificing, glorious.

It was an old saying of Cicero's, "No man was ever great without divine inspiration." And it is beyond doubt that the purer, the more unselfish the motive actuating a man, the more heroic and worshipful his life. As that motive rises towards the supreme and infinite beneficence, the more transcendent and luminous are his deeds. As Longfellow has it: "Great men stand life solitary towers in the city of God, and secret passages running deep beneath external nature gives their thoughts intercourse with higher intelligences, which strengthens and consoles them, and of which the laborers on the suface do not even dream."

Even in the lower plane of life we look with interest on the man who dares to take a risk, and if he wins we applaud. He who risks his all on a lofty object, one which touches in some way universal humanity, one that scorns sordid results, is heedless of the clamor even of those it would ennoble, who brings to this end deathless resolve and refined powers, will leave behind him something more than footprints in the sands; the living rock bears his name carved deep and plain. No matter if his age is careless of his work, the nnfolding years are sure to build a temple to his praise. It is as Emerson says: "When a man lives with God his voice shall be as sweet as the murmur of the brook, the rustle of the corn." The true man is not swerved from his course by misinterpretation or apparent failure. He knows "if his eye is on the eternal" that the transitory and the present will by and by merge into a day of cloudless beauty.

Thirty years ago men were scorned as fanatics who spoke of a law higher than the constitution; and the multitude drowned in derisive shouts the voices of those who pleaded for universal liberty as the birthright of the human soul. To-day builds marble cenotaphs over their sunken graves and writes their words among the noblest thoughts of the great age. Now, as ever, the children of those who stoned the prophets garnish the sepulchers of those their fathers put to death. Yesterday's doubt is the belief of to-day. The world has always had men who, outrunning their own age, have left blazed trees and scratched rocks whereby the multitudes following after might find their way to happier plains and climes.

Carlyle tells us the old Northmen "thought it a shame not to die in battle; and if natural death seemed coming on, they would cut wounds in their flesh so that Odin might receive them as warriors slain." They held it to be a man's duty to be brave, to subdue fear. This, says Carlyle, is true to this hour. "A man shall and must be valiant, trusting imperturbably in the appointment and choice of the upper powers. Now and always the completeness of his victory over fear will determine how much of a man he is." The perennial fibre of the man possessed of sympathetic gifts, unflinching endurance and a high motive, makes him the embodiment of Odin's hero.

Placing his chair beside that of the Abyssinian king, Gordon was told by that

royal barbarian, "I have the power to put you to death." "Do it," replied the intrepid general, "you only do for me what my religion prevents my doing myself." Such courage, such disdain of death, awed the African potentate and compelled him to submit to the man whose faith lifted him above fear. To men of this sort the world owes its deliverance from superstition, ignorance and slavery. They have given to it liberty, equality, fraternity.

Nay more, in this vast emancipation of thought and practice, not alone those who have been endowed with genius, will and benevolence in a copious degree have had a part, but all those who have been drawn into an acceptance and obedience of the sublime teachings of these men, have given something to the grand result. Unless the multitude came out to hear him, little good would the prophet do preaching in the wilderness. The gracious voice that sounded from the mountain side or rocking boat would have died on the air had not lowly toilers of the sea caught up its hallowed words and carried them around the world. A great truth, a sublime teaching, an uplifted thought does not at once reach a dulled ear or penetrate a shadowed heart. But as it is played upon by the various engines of the mind it comes into clearer light and purity, until at last the dullest intellect recognizes its worth, even to the lowest levels of life.

Few are called to guide the world; all can follow those whose prophetic eyes have seen beyond the clouds of the morning the crimson bars behind which lies the glory which shall shine one day, "redeem the world to virtue and flood it with light." The fidelities never grow old. Change touches the theories of scince—statements of philosophy and creed gather mildew and rust, but no moth burrows in the shining robe of gratitude, and in deepest reverence and love we lay garlands on the altars of sincerity, candor and truth. But while a perennial fragrance lingers around these qualities, the unfolding years interweave them with new forms and new hopes.

Out of the depths of history there comes, now as ever, one voice clearer than all others. Every new truth which contains in itself, ever so dimly, a touch of human happiness or elevation, is "of the nature of a message from on high," and will at last be hailed as the "glad tidings of joy" to all who bear burdens or patiently hope amid mists and darkness for the dawning of another day. We should be slow to reject new views or claims, lest perchance we thereby fail to "entertain angels unawares," for who can tell whether it is not as Tennyson sings:

"And may be wildest dreams
Are the needful prelude of the truth."

WASHINGTON UNIVERSITY COMMENCEMENT.

The week commencing June 9th was given to the closing exercises of Washington University of St. Louis, Mo.[1] On Monday evening the Art School gave an exhibit of the work of the past year, including drawings from the antique both in color and black and white, drawings from the nude and draped model and geometrical drawing.

On Tuesday and Wednesday the closing exercises of the Smith Academy, the Manual Painting School and the Mary Institute were held.

The commencement of the College and Polytechnic School and the Law Department was held at Memorial Hall on the evening of Thursday, June 12th.

There were fifteen graduates, six from the College and nine from the Polytechnic School. The degrees conferred were Bachelor of Arts, four; Bachelor of Philosophy, two, Civil Engineer, four; Engineer of Mines, four; Dynamic Engineer, one.

The theses of the graduates in the professional schools were quite up to the usual standard and were devoted to the treatment of some technical problem in the different branches.

The past year has been a very successful one in the history of the University. The present Freshman class is the largest ever matriculated, and the next promises to be still larger.

During the year a Professor of Dynamic Engineering has been added to the corps of professors.

The facilities for work have likewise been greatly increased in the departments of physics, drawing, descriptive geometry and practical astronomy.

It is the aim of the University to send out good men and not many men. By lowering the standard the classes could easily be doubled or trebled. In the future this standard will be constantly advanced rather than lowered. A very determined step was made in this direction by the action of the faculty during the past year, which provides for the granting of the professional degrees only after five years of study, instead of four as has been the case heretofore.

The faculty and directors of the University expect to continue this plan of a high standard. By this means they expect to attract not the greatest number, but those who are most earnest and thorough

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THE STATE NORMAL SCHOOL, EMPORIA, KANSAS.

At the State Normal School, Emporia, Kansas, Rev. Dr. Cordley delivered an able Baccalaureate sermon and Dr. Edwards, late President of the Illinois State Normal University, the annual address : subject,

1. No addresses are made at the Commencements of this institution except the orations of the students (and there is a strong disposition to cut them off), so that we must give it a somewhat different notice from the others.

"CHARACTER AS RESULTING FROM CULTURE,"

We give the following abstract of it:

This is the theme of the hour. As both the words "character" and "culture" are ordinarily used with considerable latitude, we had best begin with definitions of them. Character is the sum of the qualities which distinguish one man from another. It includes every element that enters into one's make-up. The second word will be limited to school-training, the process of acquiring knowledge.

Educational machinery abounds among us, school-houses dot the land, and schools have become the hobby of our age. What is to be the result of all this? When I view man's achievements with steam, electricity and the magnifying-glass, I am overwhelmed at the thought of his possibilities. But after all they are only instruments—good if they do good—if they add to the permanent happiness or the moral sturdiness of man. This then must be the true test of all school culture.

If you teach a fact to a child you have not only added to his knowledge but you have thrilled him with your own self, and this is by far the most lasting and important of the teacher's work. Culture is of itself a most energetic producer of character. The boy who finishes the work of a school from the primary to the college has acquired habits of industry, perseverance and self-control. The habits of mind demanded by study are all ennobling, they foster manly resolution and sturdy strength. They release the soul from the slavery of delusions that so readily take hold of ignorant minds.

Consider, for a moment, the qualities which are developed by sustained habits of study. When a young child begins the study of language the work to be done comes upon him in whelming flood; the forms of the letters, their arrangement into words, and their entirely arbitrary connection with idea present a great undertaking. The study compels a high degree of concentration. Each victory is followed by a new conflict; a line seems to stretch out further than he can see; farther, in fact, than eye hath ever seen. These conflicts and victories beget that calm patience which is the key to all true achievement, and besides patience it seems to me we may name as a distinct result the development of that cheerful courage which comes as a product of repeated conquest over difficulties. A man or boy may be afraid of something whose power he has never resisted, but no one is afraid of an enemy he has once met and beaten. He would go into such a fight with alacrity.

From this well-founded confidence comes a vast increase of strength, and many other ennobling qualities of mind are developed by the school and its processes. Industry is one, and it indirectly cultivates morality, in that it precludes immoral thoughts and tendencies by its activity. I believe that the moral stamina of the cultured man is of a sturdier, more trustworthy substance than that of the ignorant. I believe that with study comes an increase of genuine, modest self-

respect. The great idea of duty and responsibility to God should be taught, enforced and illustrated side by side with the truths of science, and there will be a mutual strengthening of the one by the other.

Another of the indirect effects of right teaching is that it strengthens the habit of seeking the truth for its own sake. In every school effort the aim is to find out what is true in the case under consideration. Absolute truth is sought to be established in every case and who can doubt that the formation of such a character is of incalculable benefit.

The qualities which we have enumerated and others which we might have enumerated, had we had time, are elements of character. They make up what is worthy in a man or woman. Whatever helps to make one patient, or industrious, or cheerful, or courageous—whatever strengthens the moral purpose, lifts the soul above the mere temporary—makes one master, not of the fleeting now, but of the on-coming duration, ennobles and dignifies humanity. And this I believe right teaching helps to accomplish.

In the process of his education the child ceases to be a plaything and comes forth a self-directive personality. He holds himself as the loyal subject of truth and duty, bound to ascertain as much truth as he can discover; bound to obey as much duty as God gives him to see, and in the end there shall appear grander beauties of soul, and divine charms of character as a fruit of this faithful training.

MUSIC AS AN EDUCATOR.

PROFESSOR F. A. JONES.

In the public school curriculum of this country music is not enumerated as an essential subject, which is the reverse in the board-schools of England, where in the various training colleges for teachers it enters as an essential subject, and there every school-teacher is required to satisfy the examiners in the first principles of music, and each college or training-school has its music instructor. The government appoints an examiner who visits the training-colleges annually for the purpose of testing the students in the music department, the present examiner being John Stainer, Esq., M. A., Mus. Doc. Oxon. Organist of St. Paul's Cathedral in the place of the late Dr. John Hullah, deceased.

If music is worth cultivating among the teachers, it is worth doing so to the best of their abilities, and what teacher can feel that he or she is fulfilling the mission allotted to them when they are unacquainted with the elementary principles of harmonic combinations; for example, a class of children are taught to sing a melody which may be defined in the widest acceptation of the word as notes in succession, such as can be produced by any single voice or instrument capable of producing but one note at a time, in contradistinction to harmony, which means notes in combination or music written vertically; but when sharps or naturals are introduced in the melody a modulation or change of key may be

induced of which the teacher may, or may not be ignorant. It may also happen that the teacher has voices in the class that are better adapted for singing second, alto, tenor or bass; then it is that the teacher's musical knowledge is brought into requisition, and he will readily be able to analyze the music, know where the modulations occur, know how produced, and also with a little careful study be able to harmonize a melody or a given bass. If true music has a moralizing tendency it cannot be over-estimated in disciplining the mind of youth, and how many persons are there, who retain until late in life the songs and verses they were wont to sing as children at school, and when the human mind is distracted from the cares of daily life and worldly amusements, it naturally lends itself to musing, and then it is that the moral influences of music and poetry are brought to bear.

A distinguished moralist has said: "To music we are indebted for one of the purest and most refined pleasures that the bounty of Heaven has permitted to cheer the heart of man. As it softly steals upon our ear, it lulls to rest all the passions that invade our bosom, arrests our roving fancy, or in louder strains excites the soul to rage. Often when wrapped in melancholy the sweet voice of music charms away our cares, and restores our drooping spirits, or awakens in us the sentiments of honour and of glory. And surely that which can assuage our griefs, pour balm into our perturbed breast, and make us forget our sorrows, is deserving of consideration, and should be made use of to glorify our beneficent Creator."

KANSAS CITY, Mo., June, 1884.

THE KANSAS CITY ACADEMY OF SCIENCE.

During the past year there have been the usual monthly meetings in the lecture season, and a number of excellent papers have been read by such gentlemen as Hon. R. T. VanHorn, E. Case, Jr., Esq., Octave Chanute, C. E., Warren Watson, Esq., and R. W. Brown, M. D., all of own city, and by Professor E. D. Cope, of Philadelphia, who kindly stopped on his way home from Mexico and favored the Academy and citizens of the city with an able and instructive lecture on his favorite subject.

All of these papers except the last named have been published in full in the REVIEW, but as the Professor spoke without notes we can only give a brief abstract of it It was delivered at the April meeting and its title was

"EVOLUTION."

The Professor was introduced by Mr. Edward H. Allen and commenced his lecture by referring to the deficient education in the biological sciences prevailing among the community, owing to their recent development and the unsatisfactory text books used for their enunciation. He said the actions of animals

were performed under influence of sensibility, as being induced by their wants, which were more or less consciously felt by them.

Then followed an interesting history of the succession of life, as displayed by the fossils discovered in rocks in the United States, of which more have been found in this country than in Europe. The variability of the different species of domesticated animals was alluded to. While the pea-fowl, guinea fowl, and the cat varied but little, the dog, pigeon, and domestic fowls were very different. This variability gave ground to the assertion that like does not always produce like. Some of the wild animals varied whereas others did not. The Professor explained that this variability above spoken of proved the change from one species to another. The variable wild species extend over a large range of country, and and if a portion of that country is submerged beneath the sea level, you destroy a certain number of variations and leave the others more distinct than they were before. The proof from fossil remains shows lines or series of forms in the successive geological periods which follow each other as though descended from one another. In that way the lines of descent of the deer, camel, horse, rhinoceros, cat, dog, beaver and other animals had been discovered in North America. The lines of the elephant, the ox, bear and hog, have not been found in this country as yet.

The question of the law of evolution is stated by Darwin to be the law of natural selection or by Spencer the "survival of the fittest," which means that of a number of varieties the one best adapted for the mode of life of the animal remained, while the less perfect ones disappeared. But this answers only part of the question, as it remains to show what was the origin of the most perfect variety, or in other words, what is the "origin of the fittest." The nearest answer that has been obtained by a study of the succession of vertebrated animals in North America, is that the best structures have been produced by the movements of the animals themselves, which cause strains, impacts and friction of the various parts of the organism which have produced changes in structure. The cause of the movements of animals is the next question for consideration. Everybody knows that animals move under the influence of conscious states, and the effect of the environment is transmitted throught the medium of consciousness or simple sensibility. It is well known, however, that the majority of the functions of animals are carried on unconsciously to the animals themselves. This is an illustration of the principle that, while all motions have to be learned in conscious states, as soon as they are learned consciousness is no longer necessary for their performance. The case is parallel to that of the human mind, which is compelled to learn lessons by conscious process, which, when learned, can be performed without consciousness. Such process, no doubt, involves a change in the structure of the brain, and is a process of evolution of the brain. This theory of evolution accounts for the origin of physical structures as well as of the mind, and allows the hypothesis of the existence of mind as a primitive attribute of some kind of matter, and as possibly existing in the universe wherever suitable physical basis exists or can be found.

At the conclusion of the address a vote of thanks was tendered Professor Cope, and he was requested to notify the Academy the next time he thought of passing through the city, in order that he might be invited to lecture again.

A considerable number of books and specimens in various departments of natural history have been added to the Library and Museum during the year, and if our citizens could find time to take proper interest the Academy would soon be an object of pride to all intelligent people.

METEOROLOGY.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	Apr. 20th to 30th.	May 1st to 10th.	May 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	33.	30.	50.	. .
Max	77.	86.	86.	. .
Min. and Max	55.	58.	68.	. .
Range	44.	56.	36.	. .
TRI-DAILY OBSERVATIONS.				
7 a. m.	49 9	54.1	55.2	53.1
2 p. m.	64.6	67.3	75.6	69.2
9 p. m.	55.5	57.3	61.6	58.1
Mean	56.7	59.6	64.1	60.1
RELATIVE HUMIDITY.				
7 a. m.	. .	.80	.84	.82
2 p. m.	. .	.71	.62	.66
9 p. m	. .	.82	.84	.83
Mean	. .	.80	.77	.77
PRESSURE AS OBSERVED.				
7 a. m.	28.899	28.927	28.916	28.914
2 p. m.	28.886	28.904	29.095	28.962
9 p. m.	28.899	28.949	28.913	28.920
Mean	28.894	28.993	28.975	28.954
MILES PER HOUR OF WIND.				
7 a. m.	. .	. .	. .	. .
2 p. m.	. .	. .	. .	. .
9 p. m.	. .	. .	.	. .
Total miles	4469	3796	4062	12327
CLOUDING BY TENTHS.				
7 a. m.	5.4	4.9	4.3	4.9
2 p. m.	4.7	4 7	4.0	4.5
9 p m.	4.6	4.4	5.2	4.7
RAIN.				
Inches	1.32	1.87	1.20	4.39

The spring continues cool and backward with abundance of rain. A white frost occurred May 2d, but did no damage. There is considerable complaint that cherries and other fruit have not set well, but those under observation of the writer promise fairly. There will be scarcely any peaches in this vicinity this year. The season has favored wheat, and corn, though backward, has as yet abundance of time for a fine crop, but it will be harder to subdue the weeds.

APRIL WINDS.

S. A. MAXWELL.

The following shows the average temperature at two P. M. of the April winds at this place for the five years ending 1884:

Direction.	No. Observations.	Temperature.
N.	7	43.85°
N. E.	28	50.64°
E.	15	53.66°
S. E.	14	60.50°
S.	20	63.10°
S. W.	22	68.21°
W.	21	54.95°
N. W.	22	49.50°
	Average,	55.55°

From this it will be seen that the prevailing winds for April during these years were from the Northeast, and fewest from the the North. These, however, were the coldest, as might be supposed; though the south winds were *not* the warmest, being due, no doubt, to the fact that the plains of Kansas, Indian Territory, and Texas are somewhat warmer than localities farther East over which our South winds blow. The Southwest winds were much warmer than any others. By striking an average I find that the warmest winds blow from a point nine degrees West of South; and the coldest from eleven and one-half degrees East of North. This is not true of all seasons, of course, there being little doubt that the Northwest winds are coldest in winter.

It is also interesting to notice that the range between North and South is about twenty degrees, while that between East and West is but one and one-third degrees. It is further noticeable that the West wind is nearest the general average; and the sum of the North and South divided by two gives the general average within one-half a degree.

Our Southwest breezes here in April tell us what spring weather is in Kansas and those from the Northwest are the "warmed over" blizzards of Dakota, yet the hegira from this state to the latter region is not yet checked.

MORRISON, ILLS., May 10th 1884.

SOME OLDER TORNADOES.

WARREN KNAUS.

A correspondent in No. 59 of *Science* calls attention to evidences of some unrecorded tornadoes in Pennsylvania, West Virginia, Indiana and some of the Canadian States.

As our knowledge of these storms has been acquired almost entirely from observation of their prevalence dating from the organization of the present Signal Service system, any notes touching them will, perhaps be more or less interesting even if not of any permanent value in adding to Historical Meteorology. With this object in view, I will notice somewhat briefly some early tornadoes in Ohio.

In almost any general history of this State a description of General Anthony Wayne's battle with the Indians on the Maumee river is given, and it is noted that the Indian warriors were strongly posted along one edge of a windfall, and that the trees were lying so thickly in front of them that the cavalry found it impossible to dislodge them by a direct attack, and this had to be done by the infantry. This battle, fought in August, 1794, is sometimes known as the "Battle of the Fallen Timbers," and is probably the earliest authentic known record of evidences of an eighteenth century tornado in this part of the United States.

About 1824 a tornado passed through Tuscarawas County, the general course of the storm being from southwest to northeast. Its width as indicated by the prostrate trees was from one hundred and fifty to two hundred yards. The track of this tornado was somewhat peculiar; instead of a uniform width of the dimension given above, off-shoots were thrown out at right angles having a width of some fifty yards, and a length of one hundred yards.

The tornado was of great severity, nothing being left standing, and the trees were thrown with a general inclination toward the centre of the storm track. When examined in this county no skips or breaks were found, but the track was continuous.

Another tornado of probably greater extent entered the State (Ohio) in Mercer County, passing four miles south of Fort Recovery, the scene of Gen'l St. Clair's defeat by the Miami Indians in 1791. The course of the storm was from the southwest to northeast, and it passed in this general direction near Bellefontaine and through Marion County. The width of the storm track, the direction in which the trees were lying and the lateral off-shoots, were similar in this windfall to the one described in Tuscarawas County, and was of about the same date.

About half a mile distant from the track of the above storm in Marion County, was evidence of a much more ancient tornado. The limits were not well defined, but it was supposed to have occurred about a century previous to its later and more extensive neighbor.

About 1854 the town of Monterey, in Mercer County, was damaged by one

of the these storms. While not extensive as regards the territory passed over, its force was very great. Trees that were lying half buried in the ground were torn from their resting place, and a stack of grain was strewn along the course of the tornado for a distance of three miles.

While the evidences of these old aerial disturbances are fast disappearing in those states where the forests are giving way to cultivated fields and these in turn are becoming the sites of thriving villages, the resident of thirty or forty years ago has no difficulty in recalling the broken, twisted and upturned trees that were left as mute witnesses of the fury of the elements in the unrecorded past.

On the treeless plains of the west a tornado is only evidenced by the destruction of the improvements of the settlers, and how many there were anterior to to the first inhabitants can never be known.

GREAT EARTHQUAKES.

England has had a good many earthquake shocks, but the one of April 22d seems to have been one of the most serious. In 1089 a severe earthquake shock was felt throughout England, and in 1274 the whole Island was shaken again, and the town of Glastonbury was destroyed. On the 14th of November, 1318, occurred the greatest earthquake ever known in England. There was a slight shock in London on the 19th of February, 1750, and both England and Scotland felt a slight shock at the time of the great Lisbon earthquake in June, 1755.

For nearly a hundred years after that there were no noticeable disturbances and only slight shocks in 1855, 1863, and 1868. On the evening of March 17, 1871, there was a severe shock in the northwest of England, in which houses were shaken and crockery broken. In the earthquake of April 6, 1580, part of St. Paul's and the Temple churches fell. But with this exception and the disturbances of 1274 and 1318 England has been more scared than hurt by earthquakes. Certainly that country has been as free from earthquake disasters as the United States, and probably has had no shake as severe as that in the Lower Mississippi Valley in 1811, when great chasms are reported to have opened in the earth. This preceded by a few months the upheaval at Caraccas, Venezuela, in which 12,000 people perished.

England, like the United States, has only experienced slight shocks, while countries not very remote have been overwhelmed by disaster. For example, in the series of earthquakes taking in the years from 1750 to 1755, England had a scarcely noticeable shake. In the same series of disturbances Adrianople, Cairo, Kaschan, Lisbon, Malaga and other cities were overwhelmed, 40,000 persons perishing at Cairo, 40,000 at Kaschan and 50,000 at Lisbon.

But even these were not the most destructive earthquakes. In 1693 Catania, in Sicily, with its 18,000 people, was literally swallowed up, not a trace of city or people remaining. At the same time fifty-three other cities and 300 villages of Sicily were destroyed, and with them over 100,000 people perished. In

1703 in an earthquake at Jeddo, Japan, 200,000 people perished; in 1731 over 100,000 people were swallowed up at Pekin, China; in 1797 over 40,000 people in South America were buried in a single second.

Although of the 225 earthquakes which have occurred in the British Islands only two or three have resulted in injury to property or loss of life, panics in regard to earthquakes have been as common in England as in Central America, where shakings up are of common occurrence. The story is told that when in April, 1750, a lunatic predicted an earthquake for the 8th, thousands of people of London, spent the night of the 7th in carriages and tents in Hyde Park.

In the earthquake of April 22d the shock was felt most in the towns lying near the east coast in a line extending from London to the northeast through Chelmsford, Colchester and Ipswich to Yarmouth, being most severe at Colchester and Ipswich.—*Chicago Inter Ocean.*

MATURITY AND LONGEVITY AS AFFECTED BY CLIMATE.

W. PERKINS.

Pope long since affirmed that

"The greatest study of mankind is man."

In accordance with this is the study of nature. Her analogies and harmonies are interesting, wonderful and charming. In no region of our vast country, as for the last three months it has seemed to me, can the wealth of these analogies and harmonies be found in greater profusion than in the "Floral State," where I now write. Coming from the colder northern clime down the great Mississippi in February, spending a fortnight in the Crescent City, as her splendid parades closed I passed on a long railroad run east to Jacksonville, the lovely gateway of Florida. Here as the first days of spring opened, all the charms of the ninety days of spring as found further north, seemed to meet in rapturous harmony. A northerner without his almanac, could scarcely tell whether he had tranced into an April, May or June day. VanWinkle-like it seemed to me as if I had slumbered in my two or three days and night's passage, through fifty, into a new season and a new world. It may be seriously questioned whether a finer or more congenial climate can be found in our world than in central and eastern Florida. Surrounded as is the peninsula by the Gulf upon one side and the Atlantic upon the other, washed by the pellucid streams and gentle rivers, of which the broad St. John is chief, the climate is tempered into its mild and lovely nature the year round.

As warmth and moisture are essential to growth, vegetables here start more promptly and mature more rapidly than further north. Seeds swell ready to sprout, in a warm moist atmosphere, occasionally in a fog, before going into the ground. The dews are heavy, at times dripping from the eaves of houses, and the occasional fogs dense, though clearing away as the sun rises an hour above

the horizon. As vegetation may partially wilt under the noonday rays, it revives and grows from early evenings till late mornings in the gentle breezes and these refreshing dews. Hence there is no hazard in planting, nor any need of "Job's patience" in waiting for the harvest. Not only may the husbandman reap that he sows, but almost as he sows. Mr. Varmadoe came near Thomasville, Ga., thirteen years ago, reduced to poverty by the war, stuck a dozen switches cut from a Leconte pear tree in the ground; they grew and have made him and three sons independent—spreading to hundreds of other families in like manner. Peaches, plums and all kinds of fruit, save such as the orange, will bear in one and two years from their seed. The fruit is often seen bending to the earth the little twigs trying to bear it.

From the unprecedented cold throughout our land, the spring even here was two weeks late. Neverthless, ripe strawberries were in the Jacksonville market the last week of February, and are abundant, as I write, the last day of May, and will be gathered from the same vines on until the last days of June. Mulberry trees growing in our yard have been yielding fruit for two weeks, and are yet having a succession of young berries which will continue to ripen for at least five or six weeks longer. So of the dewberry, the blackberry and, in a word, all the berries and fruits maturing in this climate. Though no one specimen may resist decay longer than elsewhere, yet the entire crop lasts much longer. Indeed, while the general law, that quick life and early maturity indicate early death, in this climate races considered all together seem to form exceptions. The luxury of vegetables fresh from gardens and fruits from groves and orchards may be enjoyed nearly the year round.

Besides, we find an early fruitage anolagous to the early rapid growth. In a garden near by there are a half-dozen little peach twigs two years from their seeds, each bearing fruit, ripening and which will be ready for the table in a fortnight. In another garden near by is an orange growing on a bud inserted into its stock last October, and as far as can now be seen will, by supporting its weight upon the tender twig, mature for use in due time. These are but fair specimens of the prolific nature of the vegetable kingdom in this climate.

The same law as to early maturity and productiveness is found in the animal kingdom. The infinite variety of species common to north and south, small and great, start, grow and mature earlier, in the south, while a few peculiar to the latter clime follow the same fast law. With the same analogy as to size, starting earlier and growing faster, so do animals and vegetable grow larger. The huge trees in the southern and warmer climates are known to all, the larger men and women are observed by many. In Kentucky and Tennessee they are taller than in Maine, New Hampshire and Massachusetts, while in Alabama, Georgia and Florida the average weight of one kind is above that found in the New England States. That, as we have said, youths in the far South mature earlier, there can be no question. Puberty, in Florida and the West Indies, precedes by two or three years man and womanhood as reached in Maine and Nova Scotia.

That longevity is the more common in the South may be questioned. According to the general law it would seem to be less common. Yet reasoning more closely from cause to effect, the result may seem different. A vigorous internal and external cause of life, may, and probably does cause tenacity of life. Friendly environments, other influences being equal, would evidently prolong it. Sudden changes of weather tax the system with drafts upon its vitality. When the change is severely cold the draft is so much the heavier. This often occurs in the northern States, seldom if ever in the southern. Near one-half the territory of Florida is never visited with frost or ice. Even where regions are found north, liable to few changes, the weather is regularly and severely cold from November to March, constantly calling on the vitality of the system to defend it against the disagreeable chill. This tends to shorten the sufferer's days, and is of course unfriendly to longevity. If analogy may be argued from the vegetable kingdom the same result will be reached. Trees are found larger and older in mild climates. The sizes attained in South America, California, and similar climates are marvelous. Soil and climate being favorable to their growth, and meeting with little or no impediment from winters, they grow faster and longer. Indeed it is yet unknown how long and how large may be their growth. The same may be said of some tropical animals. To mention none but the elephant, is to indicate the tendency of a mild, salubrious clime to prolong animal life. Of this huge beast the same may be said as of the huge trees: the age to which the tribe may attain is unknown. The limit of its life yet remains to be discovered. Then if life is desirable and death to be dreaded, other things being equal, the South is the better place to live. But, of course, all other things are not equal. Almost in all respects diversity between the two sections—the North and the South—obtains. Each has its pleasant and unpleasant, its happy and unhappy, peculiarities. The wiser course is to compare and strike a fair balance. This too is to be done in accordance with a knowledge of the constitutions, ages and circumstances of the parties. For weak lungs the mild and the dry air of the South is favorable. As a test of desiccation in certain localities, the long pendant tree-moss is reliable. Its nutriment in part is from a humid atmosphere. In high, dry regions it is seldom if ever seen. Hence its absence is a favorable indication for the abode of consumptives, as has been proven by experiments. The congenialities and harmonies of nature invite our consideration and enjoyment. Collide with nature and the just penalty of pain ensues; harmonize with nature and the just reward of pleasure is realized. Taking large and liberal views of life—patiently studying out the connections between causes and effects, we may attain to the chief end of life and even purity and felicity.

JACKSONVILLE, FLORIDA.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	May 20th to 30th.	June 1st to 10th.	June 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	57.°	59.°	65.°	. .
Max	79.°	90.°	90.°	. .
Min. and Max	68.°	74.°	78.°	. .
Range	22.°	31.°	25.°	. .
TRI-DAILY OBSERVATIONS.				
7 a. m.	56.6	63.8	70.8	63.7
2 p. m.	71.7	75.7	86.2	77.9
9 p. m.	60.4	64.0	71.3	65.2
Mean	62.3	67.8	76.1	68.9
RELATIVE HUMIDITY.				
7 a. m.	.907	.879	.859	.88
2 p. m.	.706	.741	.607	.69
9 p. m.	.848	.878	.871	.87
Mean	.799	.833	.779	.81
PRESSURE AS OBSERVED.				
7 a. m.	28.947	28.925	29.015	28.962
2 p. m.	28.931	28.928	29.093	28.984
9 p. m.	28.957	28.850	29.011	28.962
Mean	28.945	28.901	29.040	28.969
MILES PER HOUR OF WIND.				
7 a. m.	. .	. .	. .	. .
2 p. m.	. .	. .	. .	. .
9 p. m.	. .	. .	. .	. .
Total miles	3680	2122	1902	7704
CLOUDING BY TENTHS.				
2 a. m.	5.0	6.9	4.4	5.4
7 p. m.	6.9	6 2	4.6	5.9
9 p m.	4.6	3.8	5.6	4.6
RAIN.				
Inches	0.44	2.06	0.83	3.33

The first twenty days of June have been moist and warm, but not hot. The last decade of May brought but little rain. There have been eight thunder storms at this station in the period of this report, but no wind of great violence. As usual at this season southerly winds have prevailed. At the date closing this report, June 20th, corn is making very rapid growth and recovering from the retarding effects of cool weather and late planting. The northeastern part of the state is more backward in its corn crop than other parts, but wet weather has been general throughout the Kansas.

ASTRONOMY.

HABITABILITY OF OTHER WORLDS.

PROF. ALEXANDER WINCHELL, LL.D.

The habitability of other worlds is a question on which a vast amount of speculation has been expended. It has been the general belief that many other worlds are inhabited. Dr. Lardner argued the habitability of the Moon and all the planets. Dr. Brewster held similar views. Some have even maintained that the physical condition of the body of the Sun may be such as to produce a state of habitability. Sir William Herschel is said to have conjectured that the solar spots are the highest points—some 600 miles high—of a cool and habitable globe.

On the contrary, the habitability of other worlds has been denied on the theological grounds. It was formerly a common theological belief that the biblical teaching is incompatible with the doctrine of other worlds of beings. Dr. Whewell disputed the plurality of worlds by appeal to scientific evidence.

The question of the habitability of other worlds has generally been discussed from the assumption that all other corporeal beings must be clothed in flesh and bones similar to those of terrestrial animals, and must be adapted to a similar physical environment. But it is manifest, on a moment's consideration, that corporeality may exist under very divergent conditions. It is not at all improbable that substances of a refractory nature might be so mixed with other substances, known or unknown to us, as to be capable of enduring vastly greater vicissitudes of heat and cold than is possible with terrestrial organisms. The tissues of terrestrial animals are simply suited to terrestrial conditions. Yet even here we find different types and species of animals adapted to the trials of extremely dissimilar situations.

Nor is it to be supposed that the plans of structure of animals on other habitable planets bear necessarily any analogy to organic plans on the earth. That an animal should be a quadruped or a biped is something not depending on the necessities of organization, or instinct, or intelligence. That an animal should possess just five senses is not a necessity of percipient existence. There may be animals on the earth which neither smell nor taste. There may be beings on other worlds, and even on this, who possess more numerous senses than we. The possibility of this is apparent when we consider the high probability that other properties and other modes of existence lie among the resources of the cosmos, and even of terrestrial matter.

There are animals which subsist where rational men would perish—in the soil, in the river and the sea. No reason can be assigned why aquatic respiration should be confined to brute animals. On a planet without land, like Uranus,

high intelligence might be enframed in a gill-bearing embodiment; and resources and stimuli for intellectual activity might be discovered in the bottom of the ocean, or in the infinitesimal world which fills a slimy pool, or "swarms upon the thickly peopled air." Nor is incorporated rational existence conditioned on warm blood, nor on any temperature which does not change the forms of matter of which the organism may be composed. There may be intelligences corporealized after some concept not involving the processes of ingestion, assimilation and reproduction. Such bodies would not require daily food and warmth. They might be lost in the abysses of the ocean, or laid up on a stormy cliff through the tempests of an arctic winter, or plunged in a volcano for a hundred years, and yet retain consciousness and thought. It is conceivable. Why might not psychic natures be enshrined in indestructible flint and platinum? These substances are no further from the nature of intelligence than carbon, hydrogen, oxygen and lime. But, not to carry the thought to such an extreme, might not high intelligence be embodied in frames as indifferent to external conditions as the sage of the western plains or the lichens of Labrador—the rotifers which remain dried for years or the bacteria which pass living through boiling water. Again, there is no reason why a given amount of light should accompany intelligent organization. Many animals, not among the least intelligent, find the night their appropriate period of activity. Some exist and thrive in rayless caverns and ocean depths. On a planet dimly lighted, like Neptune, men might be organized with pupils as large as silver dollars, or even as large as dinner plates. Vision might be as distinct on Neptune as on the earth. As to warmth, a blanket of vapors may keep it in and accumulate it to the requisite extent. And in that distant time when the Sun shall become planetary, large-orbed men may move about in starlight over a surface sufficiently warmed by internal heat, and forms of vegetation may flourish and supply food for man and beast without the stimulus of solar radiations. These suggestions are made simply to remind the reader how little can be argued respecting the necessary conditions of intelligent, organized existence, from the standard of corporeal existence found upon the earth. Intelligence is, from its nature, as universal and as uniform as the laws of the universe. Bodies are merely the local fitting of intelligence to particular modifications of universal matter and force.

But let us consider how far other worlds are suited for habitations for beings akin to ourselves. This is a question for scientific consideration. The answer to the question, when asked with reference to each of our planets, is to be sought in what has been already said concerning the physical conditions of the planets. Mercury is not habitable for beings like ourselves. Proximity to the Sun results in a destructive degree of heat, if it does not actually prevent all water from finding a resting-place on the planet's surface. The Sun's apparent diameter from Mercury is more than two and a half times as great as from the earth.

In reference to Venus, and possibly also Mercury, we must bear in mind that the relations of heat and water are such that water might exist as a dense and permanent envelope of clouds. This seems the more probable, even for

Mercury, in view of Professor Langley's determination of the astonishing rate of radiation in a thin atmosphere. At the upper limit of an atmosphere sufficiently dense to support aqueous vapor, it seems not irrational to assume that escape of heat would be rapid enough to condense water even in the fierce solar heat experienced at Mercury's distance from the Sun. So far as the existence of a stratum of clouds is possible, this would, of course, serve as a screen for the surface of the planet, so that comparatively little of the Sun's direct radiation would interfere with habitability. In this view there seems no great improbability that both these planets are inhabited by intelligences organized somewhat like ourselves. The amount of water belonging to these planets being in less proportion than on the earth, the processes of evaporation and precipitation must keep it in active circulation. No very considerable bodies of water can be supposed to exist, and a large proportion of the entire surface must be accessible to occupation and cultivation. The final absorption of the water will, therefore, occur at a relatively early epoch, when, of course, habitability must end.

Thus, the first thought of these sister worlds suggests that they may be the homes of beings kindred to ourselves. Then the knowledge of the intensity of the solar radiations on their surfaces seems to preclude the belief in their habitability. But finally, a discovery of natural means for the alleviation of excessive heat leaves us with the conviction that after all we may have neighbors on the contiguous planetary territory. As to their organization, while it is profoundly true that under circumstances extremely diverse from those under which we live, extremely diverse organizations must be conceived both possible and probable; yet where the divergence is no greater than on the interior planets, all the fundamental functions and processes may be conceived analogous to our own. There is so widespread uniformity in the nature and action of physical forces that we may suspect the same in regard to organic structures and activities. As organization in its forms and functions is conditioned by the properties of matter and the laws of energy, and these conditions are widely pervasive throughout our system, we have good ground for believing that plans of organization and modes of activity are fundamentally analogous under all planetary conditions not more diverse than we conceive those of the earth and the interior planets to be. In fact, there exist contrasts of condition upon the earth nearly as wide as the contrasts between the earth and Venus. In all these contrasted situations nature employs the same fundamental plans of organization and functioning.

On the whole, as intelligence must be revealed in the cosmic organization of Mercury and Venus, there are presumably intelligent beings in correlation with the intelligible world; and as the conditions of corporeality are so far analogous to those on the earth, we may reasonably conceive organic intelligences on these planets who have power of locomotion by muscles and bones; who eat and respire; who suffer and enjoy; who cognize light and heat and sound; who observe and reflect, imagine and aspire; and, while ignorant, probably, of many or most of our arts, have invented many others of which we never dreamed, and achieve accomplishments which would be miracles to us.

The Moon, in the absence of air and water, must be without inhabitants akin to ourselves. Though the Moon has passed through the successive phases of a cooling globe, I cannot think the violence which must have reigned on its surface before synchronistic times would have permitted the existence of an organic being. Nor, since the synchronistic period began, have the conditions, as far as we can judge, been endurable. The fortnightly alternations of extreme heat and extreme cold must prove fatal to all organic life with which we are acquainted. It is pleasant to think of kindred beings on a neighboring world, though we might not by any possibility open intercourse with them. It is pleasant even to believe that the Moon may have been inhabited in a former planetary period. It creates a sense of relation to distant parts of the universe to believe that other beings may even have lived there and passed away. To know that the lunar surface is a wild scene of desolation, and to know that only the unconscious forces of inorganic nature have ever interrupted the oppressive silence of the planetary solitude, seems to sunder a bond of sympathy with the universe, and isolate mankind on an island rock where no message can ever arrive. But it is better to know the truth than to indulge in fancy. The Moon is probably no more uninhabitable in the present period than it has been during its entire history.[1]

Mars, according to the scientific indications, presents conditions more nearly approximating the demands of habitibility than any other planet besides the earth. It seems almost certain, however, that the meridian of its habitable phase is passed. The Sun's apparent diameter from Mars is two-thirds his size seen from the earth, and his light and heat are only three-eighths as much as the earth receives. As the intensity of gravity on the surface of Mars is only three-eighths the intensity of gravity on the earth, many diverse conditions would be introduced. A man of ordinary agility would be able to leap over a wall twelve feet high. If on the earth a strong man is able to support 26 pounds in his palm at arm's length, and his arm is equivalent to four pounds in his palm, he might be forty-two-feet high before the weight of his arm would become too great for him to extend it; but on the planet Mars, such a man might be 109 feet in height.[2]

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1 In my brochure, entitled *Geology of the Stars*, speaking of the comparatively rapid succession of lunar periods, I said: "The zoic age of the Moon was reached while yet our world remained, perhaps, in a glowing condition. Its human period was passing while the Eozoön was solitary occupant of our primeval ocean." Mr. Fisk in his *Cosmic Philosophy* (i, 400, note), has cited this as "an example of the too hasty kind of inference which is often drawn in discussing the question of life upon other planets." Mr. Fisk misapprehends, for it is not stated that human beings ever lived, or could have lived, upon the Moon. The allusion is simply to that stage of lunar evolution which corresponded to the human stage in terrestrial evolution.

2 If w = the total weight a strong man's arm can support, including weight of arm and load, and p = weight of arm, and n = number of times greater, in any dimension, the arm is which could bear no load, then $n = \frac{w}{p}$ (Young's *Mechanics*, Williams' ed., p. 113), and if g' = gravity on any planet compared with gravity on the earth, then, on that planet $n = \frac{w}{p\,g'}$.

Now, if we assume that a man can raise 26 pounds at arm's length, and that his arm is equal to 4 pounds in his palm, then $n = 7.5$; and if a strong man's height is 68 inches, the height of a man on the earth who could barely extend his arm—since his height is proportional to his

Again, considering that the Martial atmosphere is likely to be .105 that of the earth, and is spread over .2828 the same amount of surface its density on the surface of the planet is only .1379 that of the earth's surface atmosphere, giving a pressure on the mercurial barometer of about 4.14 inches. The height of the Martial atmosphere reduced to uniform surface density would be 2.694 times that of the earth's atmosphere, or about 13.56 miles. The surface density of the Martial atmosphere is only such as would be attained on the earth at the height of 10.2 miles.[3] This implies a universal state of atmospheric tenuity on the surface of Mars which has not been found compatible with any terrestrial life. The simple difference in mass creates conditions which would render the surface of Mars completely untenable by any human being; and this consideration, it might have been stated, applies as well to Mercury and the Moon. But this is no proof that organic beings suited to such atmospheric pressure do not exist. Animals are dredged from oceanic depths where the pressure as much exceeds the sea level pressure as the atmospheric density of Mars falls below the terrestrial standard. Animals are adapted as they are because the conditions are as they are; and we may feel assured that if the conditions were different, organic adaptations would be different correspondingly. The conceivable range of adaptations is limited only by the physical properties of inorganic matter.

On the planet Jupiter, the mass so much exceeds that of the earth that all the relative conditions are reversed. I have shown that atmospheric density is nearly six and a half times as great as on the earth. Hence respiration would only need to be six and a half times less active. On the contrary, the force required to sustain the body against gravity would be more than two and a half times as great, and all weights would be two and a half times as difficult to move. This increased weight of the body and limbs would render comparatively less efficient similar muscular efforts, while the gravitational resistances to be overcome would be greater. A man sixteen and a quarter feet high would be barely able to extend his arm at a right angle with his body. If ever the planet Jupiter attains a habitable condition its organic beings will be limited in some such manner as these numerical results imply.

The apparent diameter of the Sun from Jupiter is only .2392 or $\frac{1}{4.2}$ the same from the earth; and the Sun's radiant energies in the forms of light, heat, actinism and attraction, are only $\frac{1}{27}$ of the same at the earth. Were the Sun's heat

arm's length—would be 68 inches $\times$ 7.5 = 42.5 feet; and the height of such a man on Mars would be $\frac{42.5}{.391} = 108.95$ feet.

3 If h = the height at which the density of the earth's atmosphere is $\frac{1}{n}$ that at sea level, then, since the density diminishes in a geometrical ratio as the height increases in an arithmetical ratio, the height $2h$ will give a density of $\frac{1}{n^2}$; the height $3h$ will give a density if $\frac{1}{n^3}$, and generally the height $x\,h$ will give a density of $\frac{1}{n^x}$. But $\frac{1}{n^x} = .1379$, whence, of $n = 2$ and $h = 2{,}705$ miles, $x = 3.77$ and $x\,h = 3.77 \times 2{,}705 = 10.2$ miles.

reduced on the earth to $\frac{1}{27}$ its present amount, it is manifest that all organic life must perish. If ever, therefore, the inherent temperature of Jupiter subsides so far as to bring his surface condition to that of the earth, no Jovian climate will be such as animal organization can endure. As his actual surface temperature, however, will always be compounded of the effects of solar radiation and of conduction from within, there will be an epoch when his actual mean surface temperature will be the same as the earth's actual mean surface temperature. The vicissitudes of the seasons will be $\frac{1}{27}$ as great as on the earth—regardless of the effect of less obliquity of the axis—and the diurnal and nocturnal fluctuations of temperature will be only $\frac{1}{27}$ as great. Owing to a denser atmosphere, the fluctuations will be even less than this. The higher inherent temperature of the soil will result in so much radiation from the planet that on a planet with so large a supply of water, and in an atmosphere so dense as Jupiter's the Sun's deficient heat may be largely compensated by suppressed radiation from the planet. The situation will be that of a mild and dimly lighted "stove" in horticultural operations, highly suitable for the growth of mushrooms. It will be perpetual evening. It can not be doubted that corporeal intelligences might be coördinated to such a physical condition. For the present, however, we have not the slightest grounds for imagining the existence of organic populations upon the surface of Jupiter, unless they depart in some very extreme way from the terrestrial standard.

As to the planets remoter from the Sun, I have offered reasons for considering them advanced to a state of total refrigeration. They cannot therefore, be conceived as habitable. There was a time, however, in the history of each, when its stage of cooling produced a surface temperature suited for organic life. At that stage, the relations of organic beings on their surfaces were similar to those which may be anticipated for Jupiter, with all the greater divergences from the terrestrial condition which depend on distance from the Sun carried to successively greater extremes and successively larger proportions of water and gaseous substances. On Neptune the apparent diameter of the Sun is but $\frac{1}{40}$ the Sun's apparent diameter to us, and his heat and light are reduced to $\frac{1}{900}$ the heat and light received by the earth. This light would, nevertheless, be equal to about sixty-nine of our Moons. The excess of water however, on all the distant planets, in accordance with views heretofore presented, would probably render them, in all stages of existence, totally uninhabitable for beings like ourselves. But it is always to be remembered that other beings suited to the actual exigences of the environment, may have occupied the situation.

The earth, then, so far as we can reason, is in the middle of the habitable zone of the solar system, if our own natures are assumed as the criterion of habitability. On either side, the rigor of the physical conditions seems to proclaim our system a voiceless and lifeless desert. Even our near neighbor, the Moon, lies on the borders of this desert. Within the vast limits of the solar system there is but one happy niche where corporeal organization according to our standard can enter into material relations with the physical environment. The conclusion

is undoubtedly disappointing. But the impression is further deepened by the reflection that on our own congenial planet life is hemmed in between the terrestrial surface and the upper limit of a film of atmosphere not thicker than the mean depth of the film of ocean which enwraps the solid globe. The entire human family swarms within a sheet of atmosphere not over three miles thick. Above, are the rigors of unendurable cold and the hŏrrors of unsupported respiration. Below, are the impenetrable rocks or the submerging waves or the internal fires. Even the space about us and nearest to us is, for the greater part, inaccessible to man, and unvisited by any organic being. We need not wonder that corporeal existence is a rarity through all the realm of our system.

But there are other suns and other planetary systems, and other worlds which possess the conditions of habitability. When we look on the hosts of stars, and consider that if only one habitable planet wanders about each sun, we understand that the number of habitable worlds is countless. In this view, space seems to be densely populated. We have neighbors; they live beyond impassable barriers, but they gaze on the same galaxy, and we know they are endowed with certain faculties which establish a community between them and us. However conformed bodily, whatever their modes and means of organic activity, we know that they reason as we reason, and interpret the universe on the same principles of logic and mathematics as ourselves. The orbits which their planetary homes describe are ellipses; they have studied the same celestial geometry as ourselves; they have written their treatises on celestial mechanics; they have felt the impact of the luminous wave of ether; they have speculated on the nature of matter and energy; they have interpreted the order of the cosmical mechanism as the expression of thought and purpose; they have placed themselves in communion with the Supreme Thinker, who is so near to all of us that his voice is audible alike to the ear of reason in all the worlds.—*World Life.*

ARCHÆOLOGY.

NATURAL AND ARTIFICIAL CURIOSITIES OF THE GILA COUNTRY, NEW MEXICO.

Mr. G. M. Shaw, of this city, has just returned from a month's trip to the Gila River country in the southwestern portion of Socorro County, where he went with Messrs. Brown and Bergen to survey and report on the recent alum discoveries there, which have been located by a company of Socorro citizens.

Mr. Shaw reports almost a solid mountain of alum over a mile square, some of the cliffs of which rise to an elevation of 700 feet above the river bed. Most of the alum is in an impure state and tasting very strongly of sulphuric acid, but of which there seems to be an inexhaustible quantity. Some of the cliffs, how-

ever, show immense quantities of almost pure marketable alum. This alum find Mr. Shaw tells us, is on the Gila River about two miles below the fork of the Little Gila and four miles below the Gila hot springs.

Mr. Shaw reports numerous hot springs in that section, most of them gushing out of the rocks that form the river banks, some of them hot enough to cook in, and most of them too hot to hold the hand in. The main hot springs referred to above are reported to have effected wonderful rheumatic and other cures. The country is abundantly watered and wooded and is covered with the finest of grass. The Gila is full of trout and other fish. Game, while still moderately plentiful, has been mostly scared away from the region of the hot springs by professional and other hunters, as well as ranchmen, who are beginning to locate in this difficult-to-get-at section of the Gila. At present the only way to get into this section is with pack animals over a precipitous trail of several miles, wagons having to be abandoned in the gorge of the Litttle Gila on the North Star road, about two miles from the hot springs and about seven miles from the alum find, going from Socorro or from the Black Range. By the way of Silver City and Georgetown wagons are abandoned on "Sapio" creek with about eighteen miles northward of pack-animal trail to the hot springs.

Mr. Shaw being an amateur photographer, also, invariably carries his "outfit" along on his surveying trips, combining pleasure with business, and bringing back with him photographs of all objects and scenes of interest that he meets with on the way. He brings back from this trip over sixty photographs of the Gila country, among which are a number of exterior and interior photographs of some interesting cliff-dwellers' ruins he encountered in a cave about four miles west from the hot springs.

The cave, he says, is in a cliff which forms one side of a deep narrow gorge or cañon; it has but one entrance, which was strongly fortified; but above and beyond the entrance the cave has two porch-like openings into the face of the cliff, under and through which can be seen, from the opposite side of the cañon, the buildings extending back into the cave. Mr. Shaw says: "After a somewhat difficult climb of about 100 feet from the bottom of the gorge I reached the entrance, which is around a corner or angle of the cliff, and passing through an opening in the fortification wall and through several rooms behind it, after ascending a little slope, I found myself on the floor of the cave, which was on a level with the top of the entrance. The floor is covered with a fine, impalpable dust to a considerable depth. This cavern was of circular form, about fifty feet across and, perhaps, fifteen or twenty feet high. Looking northeast and parallel to the face of the cliff one sees the whole length of the cave, which by reason of its other front openings gives it the appearance of a porch-like gallery.

The cavern above the entrance is quite dark and seems to have been used for corral purposes, as it has no building except at the entrance. Going toward the first porch the cavern narrows down to a small passage, where the buildings begin and are continuous from here through a similar passage into the second porch. There are about twenty-five houses or rooms in the cave, varying in size

from five feet square and high to ten by twelve feet square and nine feet high. The passage is mostly from one room to another. The doorways, however, are only about eighteen to twenty-four inches high and twelve to eighteen inches wide, placed on or near the floor and form the only openings into rooms that do not need another for passage-way. The walls are made of shale stone, one and one-half to two inches thick, laid in mortar, which is almost as hard as the stone itself. The walls are about nine inches thick and as straight and plumb as any modern brick wall.

Some of the houses are two stories high. The roofs have all been burned down, the only woodwork escaping being here and there the projecting end of a rafter from the wall and the cross pieces over some doorway. Such projecting rafters are pine, with the bark taken off and about four or five inches thick, the cut end showing stone ax chopping. Some of the interiors are nicely plastered with mortar and decorated with colors and designs, seen on Indian pottery, but I am sorry to say that vandal hands have almost obliterated these decorations by scratching their names over them, perhaps in hope that their names may be perpetuated in photographs that might be attempted of these decorations. As these decorations are so obliterated by vandal inscriptions, and a photograph of them would have simply been a photograph of the vandal names, I did not waste a plate on them but left them to be execrated where they are whenever seen. Buried in the debris may be seen broken pottery, pieces of old rotten arrows, wicker work, remnants and pieces of a coarse cloth made from soap weed fibre, corn cobs the size of pop corn cobs, and innummerable other articles of household refuse. In bones I found but a single human molar tooth, with the enamel dropping off. Opposite the entrance to the main cave, in the return angle of the cliff, is another smaller cave, also with building (about half a dozen rooms), which probably was a guard cave, commanding and defending the entrance to the main cave. At the other end and a little beyond the main cave, is another large cave with a steep and sloping floor, the debris down which, with the superincumbent huge boulders, plainly show that the buildings in this cave were ground to atoms and carried down the slope with probably everything and everybody in them, by the falling of an immense layer from the ceiling of the cave. An excavation here might a tale unfold. Hanging rocks in the cave still look threatening. Whether this catastrophe caused the abandonment of the adjoining caves and the burning of their remaining homes as propitiatory offerings by their horrified and terrified dwellers is part of the mystery that now alone haunts the caves that were once the home of the cliff dwellers.—*Socorro Bullion.*

ANCIENT RELICS IN ILLINOIS.

On last Friday, May 2d, Prof. R. L. Witherell, of Davenport, and C. A. Dodge, of Albany, assisted by some other of our citizens, dug a hole about eight by ten feet, and about six feet deep, into one of the Albany mounds. As a result

of their labor they found two skeletons, one of a male and the other of a female of the human family. Neither was in a good state of preservation, but the skulls, thigh bones, and larger bones of the legs were secured. A large number of shell beads were picked up near the neck of the male skeleton, and a corrugated piece of copper, about as large as a man's hand, plated with silver, was also found lying close to the beads.

Mr. Dodge thinks that the copper plate was strung to the beads, and was, no doubt a rare ornament when manufactured. He thinks, from what he has read in science, that the Albany mounds and their contents are over two thousand years old. The copper plate he regards as a rare relic, and thinks that its duplicate has never before been found. At least there is no record of it. About the ankles of the male skeleton similar beads were also found. Mr. Dodge thinks the skeleton to have been undoubtedly that of a chieftain and the female skeleton that of his wife.

The Albany mounds, he says, are the finest on the Mississippi river. He never yet opened a mound without being more than repaid for his labor by finding many curious ancient relics of the strange people known to history as the mound builders. A great many skeletons are often found in one mound, and sometimes the largest mounds contain but one or two skeletons. He thinks that the mound builders buried their leaders and chieftains apart from other people, who were buried less pompously, by many of them being buried in one grave or mound. At no distant day he thinks that another mound may be opened.

The contents of the Albany mounds have proven of much value to scientists already, and our little city may expect at any time a visit from distinguished men of science and study, who think it well worth their time to investigate these wonderful sepulchers, and especially when they have proven so productive of wonderful and curious relics as have the Albany mounds.—*Albany (Ill.) Times.*

OLD EGYPT.

Statements in regard to the scope and purpose of the coming European conference upon Egyptian affairs are so various and contradictory that it is impossible, at this date, to even guess intelligently about the final result, so far at least as details are concerned. But it is reasonably certain that some definite decision will be reached by the conferring parties, so that when their deliberations are concluded and the arrangement agreed upon duly confirmed, a new chapter will open in the eventful history of a nation whose most vigorous and glorious life ended before history began. For the first time since Egypt ceased to be a province of the Roman Empire, she will be brought under the controlling and direct influence of European civilization; for Turkey, though in Europe, is not of it and Egypt has lost rather than gained by her connection with a power essentially Oriental in principles and practices, and therefore essentially unprogressive. Without speculating upon the future now dawning, it may be interesting to glance

briefly at a past altogether unique in the annals of the world; a past so remote that when Cæsar and his Commentaries were baptized in the harbor of Alexandria, and Marc Antony lay dreaming in the arms of Cleopatra, it was even then shrouded in the mists of immemorial antquity.

It is a curious and instructive illustration of the vicissitudes of human affairs that the destinies of Egypt should now be in the hands of nations which were unborn when she had practically passed from the stage of active life; her work completed, her mission finished. Before a single stone was laid where now stand London, Paris, Berlin, Vienna, splendid cities covered Egyptian soil. When the waters of the Thames and the Seine were vexed only by the rafts or canoes of wandering barbarians, the waters of the Nile floated the barges of Egyptian kings and washed the walls of palaces and temples larger and grander than Windsor and Westminster, the Louvre and Notre Dame. When the ancestors of the English, French, Germans and Austrians of to-day were the rudest savages, struggling for precarious existence with beasts scarcely more wild and savage than themselves, the inhabitants of Egypt were a highly organized society, with all the departments of the social system in full operation, with an elaborate government, an extensive literature, and a religion from which later religions have drawn some of their noblest ideas. When the roving prehistoric people of Europe were cave-dwellers, because they knew nothing of huts, much less of houses, the prehistoric people of Egypt built the pyramids, reared the shrines and colonnades of Luxor, excavated and frescoed the rock tombs of Thebes, carved the mysterious Sphinx and the colossal statues of Rameses. When in all Europe there was not a line of written language, Egyptian monuments bore volumes of those strange hieroglyphics which are now the admiration and the study of European scholars. When throughout Europe men and women bowed down to sticks and stones, in a fetich worship as gross and degrading as that of the negroes of Central Africa, an Egyptian priest—on a papyrus supposed to date 3,000 years before the Christian era—expressed a popular belief in one God, supreme and indivisible, in the immortality of the soul, and in rewards and punishments beyond the grave. The original of that ark of the covenant which Moses constructed, and which found final lodgment in the Holy of Holies at Jerusalem, is still to be seen in an Egyptian painting done before the great Hebrew leader and law-giver was rescued from the cradle of bullrushes; and the brazen serpent he raised for the salvation of his followers in the wilderness has its counterpart among Egyptian figures designed and executed before Abraham pitched his tent in the land of Canaan. Modern civilization and culture make sufficiently generous acknowledgment of the vast debt they owe to Greece and Rome; but how seldom is it even hinted that our civilization and culture owe anything of consequence to Egypt. Yet centuries before Romulus raised his wall on the Palatine Hill, or the beginnings of Athens clustered around the Acropolis, Egypt was the world's school and library. Art and science flourished there when no sign of either was visible elsewhere. Solon went there to learn legislation, Herodotus to learn history, Plato to learn philosophy; and no great teacher in any important branch of knowledge considered him-

self competent to teach until he had sat at the feet of Egyptian masters and drunk deeply at the fountain of Egytian learning. There is some unconscious acknowledgment of our indebtedness to the men who lived and thought and toiled and died on the banks of the Nile thousands of years ago. Egyptian ideas are reproduced in our architecture and ornamentation, metaphysics and theology; Renouf, Eber, and many other brilliant intellects are devoting their lives to the manuscripts and inscriptions in which the Egyptian mind reveals itself; and more brain and pen labor has been given to the mechanism and meaning of the Pyramids than to the grace and beauty of Parthenon and Pantheon. But a broad margin of justice still remains unfilled; and whenever—if ever—full justice is done to the achievements of a vanished race, Greece and Rome will look small to an intelligent and impartial eye as compared with Egypt. The ancient kingdom of the Pharaohs occupies but an insignificant part of the earth's surface; only a narrow strip of ground on either side of the river whose annual overflow redeemed it from the desert—so narrow that at the widest place a man on horseback can cross it in less than a day, and in the upper portion in a few hours. Yet from this little spot, almost lost upon the map, influences have radiated to the farthest limits of Christendom and heathendom. It has been among the most potent factors of the world's education, and its power, though perhaps unrecognized by the majority, will be felt while the world endures. The Egypt of to-day is a mere geographical point, a bit of territory for European Governments to wrangle over, European soldiers to take and hold, European statesmen to rule well or ill as they see fit. The people who made Egypt what she was, and what she never can be again, have disappeared forever, crushed out by the relentless heel of Persian, Roman, Arab and Turkish conquerors. Their degenerate descendants are unworthy to bear an illustrious name; the mummies in the pits are entitled to more respect than the fellaheen who dig up and sell them. Ages of grinding oppression and hopeless ignorance, in which the sword and the whip have had full swing and sway, have produced their legitimate result in a cowardly and contemptible race, utterly incapable of self-government and fit only to wear a foreign yoke. But, for the sake of Egypt's past, if for nothing else, it is to be hoped that Egypt's future will be brightened and bettered by the new regime which the conference must introduce; and that the modern Egyptians may receive whatever elevation, advancement and general prosperity their capacity permits from nations which were at the bottom of the ladder when ancient Egyptians were at the top.—*Globe-Democrat.*

BOOK NOTICES.

A GRAMMAR OF THE CAKCHIQUEL LANGUAGE OF GUATEMALA: By D. G. Brinton, Philadelphia, 1884; pp. 72, 8vo.

The Maya dialects constitute a group of Central American languages which have been investigated by the Spanish missionaries with untiring industry and corresponding success from an early epoch. Their poverty in grammatic forms renders their acquisition rather easy, although the phonetic part presents some difficulty to strangers. The Maya dialects spoken in Guatemala are divided by Dr. O. Stoll, a recent investigator among the Indians of that country, into three sections, called by him the Pokonchi, the Qu'iché and the Mame group; at an early period the Qu'iché language separated into two main dialects, the Qu'iché proper and the Cakchiquel, and subsequently the latter of these formed a sub-dialect called the Tz'utujil.

There is in the library of the American Philosophical Society, in Philadelphia, a volume containing several tracts in Cakchiquel and Spanish, one of which, composed by an anonymous author in 1692 (54 pages), embodies a grammar of it and has just been published in an English translation by Dr. Daniel G. Brinton. To increase the value of this publication, the learned editor has combined with this material all the further information which he could obtain upon this guttural tongue from two manuscript grammars in his own library: that of Benito de Villacañas, a Dominican missionary in the tribe, who died 1610, and that of another ecclesiastic, Estevan Torresano, who wrote shortly after 1753. Without altering the unscientific plan which the authors have followed in their work, Dr. Brinton has at least improved it by adding numerous critical notes to the rules and paradigms of the padres, and prefaced the whole by a useful bibliographic introduction. An autographic map of Western and Central Guatemala is a very welcome addition to the volume.

A. S. G.

THE TRUE THEORY OF THE SUN, Showing the Common Origin of the Solar Spots and Corona, and of Atmospheric Storms and Cyclones: By Thomas Bassnet. G. P. Putnam's Sons, New York, 1884. $2.00.

The salient points of the "true theory" as set forth in Mr. Bassnet's book are the following:

1. All space is flooded with an ethereal fluid possessing the common properties of matter but imponderable.

2. At the sun a vortex has been formed in this fluid which keeps up a perpetual current through the system.

3. The solar spots are due to displacement of the sun from the center of the vortex; the corona and protuberances are due to the ether or electricity escaping from the sun (electricity being treated as a gas similar to air); the same theory of vortices is made to explain the formation of cyclones and tornados in the earth's atmosphere.

Mr. Bassnett and his papers will be remembered by members of the American Association who attended the Cincinnati meeting, especially the members of section A.

This book is evidently given to the world by the author in the honest belief that it is right, and that all modern science is wrong. As the result of much labor and study it deserves to be treated with respect; as a scientific treatise it contains the most glaring errors and assumptions, all of which have from time to time been pointed out.

It is somewhat interesting to note the number of persons in the United States who feel competent to give the "only true" theory of the physical universe. As in the present instance, these theories often contradict the best known laws of mathematics and physics, and go directly against the teaching and experience of the masters in science. In America there is, perhaps, a larger class of men who feel competent to propound a theory of the universe, who are ignorant of the principles of mathematics and physics necessary for such discussions, than elsewhere. Mr. Bassnett proceeds with charming *naiveté* to construct a theory in which he controverts the most ordinary principles established by men of science, and then complains most bitterly of the blindness and stupidity of these same men of science who refuse to pay any great amount of attention to his talk.

Along with its peculiar "theories" the book contains many facts of astronomy. To the student it will be worse than useless and to the scientific man valuble only as a curiosity.

H. S. P.

THE WOMAN QUESTION IN EUROPE: Edited by Theodore Stanton, M. A. Octavo, pp. 478. G. P. Putnam's Sons, New York, London and Paris. For sale by M. H. Dickinson, $3.50.

This is a series of essays by capable writers—mostly women—of England, Germany, Holland, Austria, Norway, Sweden, Denmark, France, Italy, Spain, Portugal, Belgium, Switzerland, Russia, Poland, Bohemia, and the Orient, upon the movement in recent times for the amelioration of the condition of women in all these countries. In the arrangement of the chapters an ethnological order has been maintained, viz.: Anglo-Saxon England, the Teutonic countries, Scandinavia, the Latin nations, the Slavonic States and finally the Orient.

The work is rather a compilation of facts upon than a philosophical study of the subject, though several of the essayists have given in their papers the results of profound and critical consideration of its various branches. Thus, in the chapter upon England we find discussed first, the Woman's Suffrage Movement;

second, the Women's Educational Movement, the Women in Medicine, the Industrial Movement, and Women as Philanthropists. In that upon Germany a general review of the movement is given, as well as an account of the National Association of German Women, and in that upon Italy a general review and a history of the Educational Movement. Among the English essayists, one of the principal is Mrs. Fawcett, wife of Mr. Henry Fawcett, Postmaster-General of Great Britain, and Professor of Political Economy in Cambridge University. Mrs. Fawcett was led to study the same subject through reading to her husband, who is blind. She was one of the foremost women in England in publicly advocating and discussing the political enfranchisement of women, and is a competent authority on all similar subjects. The other English writers in the volume are Mrs. Maria G. Grey, Francis E. Hoggan, M. D., Miss Jessie Boucherett and Mrs. Henrietta O. Barnett, all able and distinguished in their several spheres. Their contributions fill nearly one-third of the work, which, in view of the marked progress made in Great Britain in the direction of the political rights of women, is entirely proper. As Miss Cobbe says in her introductory chapter, "Of all the movements, political, social and religious, of past ages, there is, I think, not one so unmistakably tidelike in its extension and the uniformity of its impulse as that which has taken place within living memory among the women of almost every race on the globe. Other agitations, reforms and resolutions have pervaded and lifted up classes, tribes, nations, churches. But this movement has stirred an entire sex, even half of the human race. * * * . But the crown and completion of the progress must be the attainment of the political franchise in every country wherein representative government prevails, and till that point be reached there can be no final satisfaction in anything that has been achieved."

For any one desiring a compendious history of the woman question in all lands, written by the most competent writers and edited by a careful and conscientious editor, this work is about all that can be asked.

SHAW'S NEW HISTORY OF ENGLISH LITERATURE: Edited by Truman J. Backus, LL.D. 12mo., pp. 480. Sheldon & Co., New York and Chicago, 1884. For sale by M. H. Dickinson, $1.25.

For a number of years past Thos. B. Shaw's "Outlines of English Literature" has been regarded by teachers as a standard work. In its revised form it presents many improvements in arrangement, unity and simplicity of style. President Backus has given a fuller discussion of the old-English and middle-English literatures; an assignment of prominent positions to the most famous writers: a free use of quotations from the works of the best English and American critics; a collection of references to the best collateral readings upon the topics considered, and the use of a few simple diagrams for the aid of students in remembering important classifications of authors. The chapters upon English literature in America are the sole work of President Backus himself, and are very complete, having been entirely re-written for this edition.

MODERN FOREST ECONOMY: John Croumbie Brown, LL.D. 12mo., pp. 228. Edinburg. Oliver & Boyd.

In furtherance of an International Forestry Exhibition in Edinburg in 1884, to which a number of scientific, practical, and professional gentlemen pledged their assistance and co-operation at a meeting held in March, 1883, Dr. Brown has prepared this little work. It is intended as an introduction to the study of forestry, so that those who read it will be better prepared to appreciate and be benefited by the proceedings. It embraces an account of the origin of forests and the consequences of their destruction; chapters upon the ancient forests of Europe and their disappearance, together with an indication of the evils that have followed their destruction, such as floods, inundations and torrents, avalanches landslides and sand drifts; also upon forest conservation, sylviculture, diseases of trees, forest administration, etc. Dr. Brown has devoted a good share of his life to this subject and may be regarded as a standard authority on all branches of it.

THE UNITED STATES ART DIRECTORY AND YEAR BOOK: Compiled by S. R. Koehler. Octavo, pp. 440, including engravings. Cassell & Co., New York, London and Paris, 1884. For sale by M. H. Dickinson, $2.00.

This work is intended as a guide to all persons interested in the progress of art, art patrons, students of art and its history, and travelers of an artistic turn of mind, by pointing out to them the facilities existing in the United States for the enjoyment, the study and the commerce of art. It contains a chronicle of events in the art-world like exhibitions, sales, museums, and private collections, question of tariff, copyright law, etc.; also lists of national and local institutions devoted to art, a directory of artists and of art teachers; to which is added a classified index of everything in the book. Nearly two hundred pages are devoted to the "Souvenirs of Exhibitions" being engraved copies of the very best oil paintings, water colors, drawings, etchings, etc., that have been exhibited by American artists in this country and Europe within the past year. For the purposes of artists themselves or patrons of art, this book—the second in the series—will be found very useful. It is handsomely printed and the engravings are unusually well done.

SIX CENTURIES OF WORK AND WAGES: By Jones E. Thorold Rogers, M. P. Octavo, pp. 591. G. P. Putnam's Sons, New York, 1884. For sale by M. H. Dickinson. $3.00.

The first part of this massive book is devoted to an account of early English society up to and during the latter half of the 13th century and particularly of the principal pursuit of the Englishmen of that period, agriculture; also to the occupations of the townspeople, and finally with the various classes who made up mediæval society; all of which is embraced in the first six chapters, under the

titles, Introduction, Rural England—Social Life, Rural England—Agricultural, Town Life, the distribution of Wealth and Trade, Society—Wages—Profits. The remainder of the work deals especially with the history of labor and wages, great research having evidently been bestowed upon it, a general history of agriculture, and some particulars of the political history of England—in fact this point is not overlooked at any time—with an attempt to show that "the pauperism and degradation of the English laborers were the result of a series of Acts of Parliament and acts of government designed or adopted for the express purpose of compelling the laborer to work at the lowest rates of wages possible and which succeeded at last in effecting that purpose."

Chapters xviii and xix are devoted to a consideration of wages in the 19th century, as affected by the competition of capitalists, realxation of foreign tariffs, etc.; the present situation with its trades-unions, unequal distribution of wealth, its need of reforms in the land system and local taxes, the power and weakness of labor, etc. Chapter XX sets forth the remedies suggested to the author, among which it is needless to say protective tariff is not named.

The author was formerly Professor of Political Economy in King's College, and writes as an expert. His style when the matter allows is free and attractive, his views are those of Englishmen in general, which differ widely from some of the best thinkers and writers upon political economy in this country. No book of the day contains so great an array of facts, so pertinent to questions arising and certain to continue to arise as the United States increases in population, and the lines between land-owner and laborer are more distinctly drawn.

GEOLOGY AND MINERALOGY OF CHEROKEE COUNTY, KANSAS: By Erasmus Haworth, B. S. pp. 48, octavo.

We have received from Prof. Erasmus Haworth, of Penn College, Oskaloosa, Iowa, a forty-eight page pamphlet, entitled "A Contribution to the Geology of the Lead and Zinc Mining District of Cherokee Co., Kansas." This essay was prepared by Professor Haworth as a thesis to accompany his application to the faculty of Kansas University for the degree of Master of Science, and is a very full and complete geographical, geological and mineralogical description of the region in question. It also contains a discussion of the mode of ore occurence, the origin of chert and of the lead and zinc sulphides. It is a valuable contribution, scientifically and commercially, to the literature of Kansas geology, and would seem to possess especial value to the property owners and miners of Southwest Missouri and Southeastern Kansas. The author formerly resided in the region and has made its peculiarities a study for several years past. Professor Haworth desires us to say that he will send the pamphlet *gratis* to any one who will inclose him a two cent stamp for postage.

COUPON BONDS AND OTHER STORIES: By J. T. Trowbridge. 12mo., pp. 411. Lee & Shepard, Boston, 1884. For sale by M. H. Dickinson, $1.50.

This volume comprises ten of Mr. Trowbridge's characteristic stories, the best of which are "Coupon Bonds," which gives the title to the book, and "Fessenden's." The others, however, are all good, including "Madame Waldoborough's Carriage," "Archibald Blossom, Bachelor," "In the Ice," "Nancy Blynn's Lovers," "Mr. Blazay's Experience," "Preaching for Selwyn," "The Romance of a Glove," and "The Man Who Stole a Meeting-house."

Mr. Trowbridge has written a great many stories, in fact has been a well known novelist and story-writer for nearly forty years, and has lost none of his popularity even yet. He is a welcome contributor to *St. Nicholas*, and is highly regarded by all youthful readers. The book in question is handsomely put forth by the publishers, and the stories included will by no means lessen Mr. Trowbridge's credit.

OTHER PUBLICATIONS RECEIVED.

Magazine of American History, Mrs. M. J. Lamb, Editress, New York, June, 1884, 50 cents, $5.00 a year. Marietta College Alumni Memorial 1882–3, published by Alumni Association, Marietta, Ohio. Illusions, by James Sully, *Humboldt Library*, in two parts, price 15 cents. The Wonderland of the World, 1884, St. Paul, Minn. Catalogue of Marietta College 1883–4, I. W. Andrews, D. D. President. 18th Annual Catalogue of University of Kansas, 1883–4, J. A. Lippincott, LL. D., President. The *Kansas Medical Journal*, LaCygne, Kas., May, 1884, published by J. Milton Welch, $1.50 a year. The *Medical Index*, $2.00 per year, Kansas City, Mo., June, 1884. Report of the Kansas State Board of Agriculture, for month ending May 31, Wm. Simms, Secretary, Topeka, Kansas, 1884. Kansas, its Horticulture, Agriculture, Live Stock, Wm. Simms, Secretary, Topeka, Kansas. Fifth Annual Report of Executive Committee on Classical Studies at Athens; Boston, Mass., 1884. Proceedings of Boston Society of Natural History, Vol. 22, Part III, March, 1883, October, 1883, April, 1884. Remarks on Professor Newcomb's "Rejoinder," James Croll, LL.D., F. R. S. *American Meteorological Journal*, Vol. 1, No. 1, May, 1884, $3.00 a year, W. H. Burr, Detroit, Mich. Thermometer Exposure, H. A. Hazen, pp. 23. Reports of Professor of Agriculture, Kansas Agricultural College, 1884. Bulletin of Philosophical Society of Washington, Vol. 6, 1884, J. C. Welling, President. *Chicago Popular Monthly*, May, 1884, $1.50 a year. 16th and 17th Annual Report of the Peabody Museum, Vol. 3, No. 3–4, Cambridge, Mass., 1884. Report of the U. S. Fish Commission for 1881. Report of the Officers of the Smithsonian Institution for 1881. Third report of the U. S. Entomological Commission 1880-82. Wisconsin Historical Collections, vol. ix, 1880-82. Walls that Talk —Libby Prison, 25c. Mound Builders' Works near Newark, Ohio, Isaac Smucker, pp 10. Hand-Book of the St. Nicholas Agassiz Association.

BOOKS TO BE NOTICED.

Science Ladders, G. P. Putnam's Sons. What Is to be Done—A Hand-Book for the Nursery, Lee & Shepard, Boston. Catarrh, Sore Throat, and Hoarseness, G. P. Putnam's Sons. Seven Decades of the Union, (H. A. Wise) Randolph & English, Richmond, Va. Elements of Rhetoric and Composition, (D. J. Hill) Sheldon & Co. N. Y. Politics, (W. W. Crane & Bernard Moses) G. P. Putnam's Sons. Barbara Thayer, Lee & Shepard. Times of Linnæus (Topelius), Jansen, McClurg & Co. Life of Liszt (Nohl), Jansen, McClurg & Co.

SCIENTIFIC MISCELLANY.

RECENTLY PATENTED IMPROVEMENTS.

J. C. HIGDON, M. E., KANSAS CITY, MO.

SEEDING ATTACHMENT FOR CORN-DRILLS.—This improvement consists in attaching to a corn or seed planter of any description a sprochet chain having reversible lugs pivoted longitudinally to each link or every alternate link, as may be desired.

The lugs are pivoted to project at a right angle from the length of the chain links, and being reversible they may be thrown from one side to the other of the chain, in or out of gear, with teeth projecting upon the circumference of the seed plate, according to the distance apart it is desired to drop the seed. For instance, to drop very close, all the lugs are thrown in gear with the seed-plate, and, on the other hand, by reversing all of the lugs except one, seed may be planted such a distance apart as corresponds with the full length of the chain; while with a common check-rower or listing-drill, owing to their faulty construction, dropping can only be accomplished at comparatively shorter intervals.

The chain links are preferably constructed of malleable iron, and of the form previously described—that is, the lug-links have, near each end and projecting from the side opposite the driving-wheels, ears or lugs, between which the main lugs are pivoted.

To prevent sagging it is preferable to provide a support for the chain near the point where the lugs come in contact with the teeth of the seed-wheel, and for this purpose an anti-friction roller may be used.

This attachment may be arranged to operate any desired number of seed-plates, so that several rows will be planted at a single operation.

The inventor is Mr. Emile Lind, of Hiawatha, Kansas.

ENVELOPE OPENER AND PAPER-CUTTER.—This is a new and improved device of simple construction and consists of a blade or strip of metal, ivory, hard rubber, bone, or celluloid, having a fork at each end, all of the prongs being cutting edges.

The prongs are also slightly tapered toward the ends and are provided with rounded points.

An aperture is formed in the centre of the blade and this opening is surrounded on each side of the blade by a raised ring, the inner edge of which is beveled for forming two cavities for receiving the ball of the thumb while using the instrument.

To open an envelope, which is a very simple and speedy operation, one of the cutting prongs is passed under the flap and moved along the edge of the same.

Paper is cut in a similar manner, but the outer edges of the prongs are used.

The instrument is quite small and handy, and the aperture permits of hanging it on a hook when not in use, but the cutter was designed for carrying in the vest pocket, by Mr. C. E. Hochstetler of this city.

STEAM-ENGINE OR WATER-MOTOR.—This engine consists of a working-cylinder of the form termed "segmental," a piston fitted therein, a piston-rod bent to the proper circle and connected at each end to working-arms that oscillate upupon a pin in the engine framing.

The cylinder is provided with combined induction and eduction balanced-valves operating between the faced surface of the cylinder covers and the ends of the cylinder.

The valves are operated by rods attached to a pin inserted in the boss of the working-arms and the whole is arranged to operate a crank by means of the shorter of three working-arms and a connecting rod, the arrangement sought for being to use a much shorter crank than is usually employed in engines and to obtain a leverage over the work also by the special form of the valves and direct ports, to give the freest admission and ejection to the steam or water.

In operation, steam or water being admittted to the cylinder through an induction port, the piston is driven thereby to the opposite end of the cylinder, meanwhile the valves have changed positions and the propelling fluid is admitted to the other side of the piston. The exhaust port of the starting end has liberated the contained steam or water while the exhaust valve of the opposite end is in a reverse position.

The eduction ports of this engine being situated at the extreme lower corner of the cylinder, it is especially adapted for use as an economical hydraulic engine and its compact form will allow of its being placed where other motors could not, because of the space occupied by them.

Mr. Gerritt S. Peppard of this city is the inventor.

THE KRAKATOA ERUPTION.

PROF. LOUIS G. CARPENTER.

AGRICULTURAL COLLEGE, LANSING, MICH., June 17, 1884.

EDITOR REVIEW.—Inclosed I send a small quantity of ashes from the celebrated Krakatoa eruption near Java last August. These were received through an acquaintance, of this State, who received them directly from a visiting friend, a sailor, who was on board the Karnek, at the time, near the Strait of Sunda.

The following is the account of the sailor, Mr. Becker, as repeated to me: "They were about two hundred miles from the island, sailing toward it, when about 10:30 A. M. they heard the tremendous report, and at about 3 o'clock these ashes began to fall, coming thicker and thicker until 4 o'clock the next morning. At 5 o'clock when they were falling the fastest, he could not see his hand before him. The deck of the ship was covered eighteen inches deep. They passed through the Strait of Sunda, the ship plowing through dead bodies as upon a great battle-field. Where the city of Anjer had stood with about 9,000 inhabitants, when they came there, there were fifteen fathoms of water standing over it and only two men had escaped alive, one an European minister, and the other a native. One-half of the island is sunk, and many small islands have arisen."

This corroborates the many accounts in the European magazines. But the feature of special interest in this account is the explosion, and the time of hearing it. If the report was "tremendous" at a distance of 200 miles it is not difficult to believe the account, which the great barometric disturbances do not render improbable, of those at much greater distances. If the time of hearing the explosion was local time then the explosion itself must have taken place at about 10h. 10m. local time, which closely agrees with the results reached by Gen. Strachey from the air-wave, and by Maj. Baird from the tidal-waves, the former giving 9h. 24m. and the latter 10h. 30m. as the time of the explosion.

PROCEEDINGS OF THE IOWA ACADEMY OF SCIENCE.

The Academy of Science met June 8th, President Fulton in the chair. The minutes of the last meeting were read and approved.

F. A. Mann, editor of the Halifax *Journal*, at Daytona, Florida, who is also a member of the Academy, sent the following contributions to the cabinet:

1. Some shells taken from the sub soil of the "mammocks," or low, rich lands, formed by the action of the sea along the east coast of Florida.

2. Specimens of what is usually called "tree-coal," taken from a depth of two feet below the surface of the "mammocks," along the eastern coast of Florida.

3. A specimen of "coralline limestone," taken from an artesian well at a

depth of 158 feet below the surface, on the eastern coast of Florida. The stratum of limestone is twenty or more feet in thickness, and is termed "coralline limestone," because it is chiefly composed of disintegrated coral.

4. A specimen of marl taken from "mammocks" sub-soil on the east coast of Florida.

5. A specimen of coral from the outer reef off the coast, near Daytona, Florida, and brought in by the breakers.

6. A specimen of what is called coquina or soft stone, composed of the fragments of very small shells.

Accompanying these specimens was an interesting letter from Mr. Mann describing the coral reefs, which was read by the president. The Academy tendered Mr. Mann a vote of thanks for his contributions.

President Fulton then exhibited a specimen of copper ore found in Iowa, and read the following paper in connection:

"COPPER IN THE DRIFT OF IOWA."

I wish to exhibit to the Academy a very pure specimen of native copper ore found by Dr. John D. Parker, who resides ten miles southeast of Winterset, and near Peru post-office, in Madison County, Iowa. He found it while digging out a spring on his farm in that vicinity, at a depth of nearly six feet from the surface of the ground, and under circumstances which preclude any supposition that it may have been placed there recently, or since the settlement of the country by white people. The weight of this specimen is just ten ounces. On one side of it you will observe an irregular cavity, in which some small particles of quartz still adhere. Its general shape and appearance indicate that since it became detached from its original and native bed, it has been worn by the action of water, ice, and the various other forces which grind up the rocks into gravel and pebbles. Doubtless its original home was the Lake Superior copper region, but during that ancient time which geologists term the glacial epoch, or the age of ice, it was transported to the place where Dr. Parker found it by the same action which scattered the boulders over the prairies of Iowa, hundreds of miles from where they originally reposed "in place," in the far north. There have been numerous instances of the finding of native copper in connection with the drift of Iowa, in pieces varying from a few ounces to thirty pounds or more. A lump found by Col. W. S. Dungan, in Lucas County, Iowa, some years ago, weighed over thirty pounds. Wesley Redhead, Esq., Des Moines, is the owner of a fine specimen, weighing several pounds, which was found some years ago in the vicinity of Des Moines, and through his courtesy I also have the pleasure of exhibiting that specimen to the Academy. These specimens are in all respects similar to the native copper of the Lake Superior mines, as you may see by comparing them with the other specimens from my private cabinet, and which were taken directly from the mines a few years ago. Those mines were originally the home of all of them. We infer, from the finding of these fragments of copper in the drift of Iowa, that sometime during the glacial epoch the glacial current passed in a

southwesterly direction. The occasional finding of fragments of the common sulphide of lead in the drift of Iowa, in a southwesterly direction from the lead region about Dubuque, would indicate the same fact. Perhaps long subsequent to that part of the glacial epoch, during which these fragments of copper and lead were transported from the northeast, the glacial currents changed their course, and assumed the direction which brought about the present drainage system of Iowa—a general movement of those currents from nearly north to south. During that wonderful age, known in the geological calendar as the glacial epoch, the topographical conformation of the North American Continent was no doubt vastly different from what it is at the present time. That age of ice may have extended over many thousands of years, and until the latter part of it the Mississippi with its great valley did not exist. The present drainage of Iowa is the result of the later glacial currents, the currents which carried down in their flow the great granite and quartzite boulders now found so far "out of place" that we sometimes term them "lost rocks." As the climate gradually changed, through influences which astronomers explain, the glaciers slowly subsided, and these erratics were lodged as we find them, with their worn and rounded shapes and peculiar markings, still bearing the evidence of the forces to which they were subjected, just as the pebble you pick up on the beach of the Des Moines river shows by its oval and worn appearance the result of the action of the water. Every pebble, every grain of sand on the shores of our rivers was once a part of some stratum of rock in its proper geological position, but was displaced and carried away by the forces of nature, just as the fragments of copper were during the great ice age. These natural forces have never been suspended, for, in a modified degree, the same process is still going on. In our river valleys, with the constant alternations of heat and cold, dearth and flood, the rocks are still being ground into gravel and sand.

O. P. Pence, the treasurer, made a report stating that the society was out of debt and had nearly enough on hand to meet the next quarter's rent.

The following resolution was offered by T. G. Orwig and unanimously adopted:

"In view of the lamentable fact that much disease and suffering is occasioned by sewer gas and that all efforts heretofore made to economically and satisfactorily dispose of sewerage have failed, and

Whereas, Mr. Andrew Engle, of Metz, Iowa, has invented a method and apparatus for converting sewerage (urine, night soil and kitchen offal) into gas and charcoal that can be utilized for producing light and heat, and has demonstrated the merit of his invention by a practical test in the courthouse at Newton during the past month; therefore be it

Resolved, That we recognize the importance of Mr. Engle's scientific efforts in sanitary reform and respectfully request him in the interests of science to exhibit a model of his apparatus and explain the philosophy of his invention at our next monthly meeting, Tuesday evening, July 8."

Adopted.

The following officers were then elected for the ensuing year:

A. R. Fulton—President.

R. S. Miller—Vice President.

H. L. Chaffee—Recording Secretary.

Dr. W. M. Thomas—Corresponding Secretary.

O. P. Pence—Treasurer.

W. Bailey—Curator.

A. M. Forster—Librarian.

Directors—Geo. C. Baker, T. G. Orwig, R. S. Miller, A. R Fulton, H. L. Chaffee.

The Academy adjourned to meet on the second Tuesday in July.

NEW RAILROAD LEGISLATION IN ENGLAND.

HON. GEO. C. PRATT, R. R. COMMISSIONER OF MISSOURI.

EDITOR KANSAS CITY REVIEW:—If you include "transportation" among the industries coming within the scope of your REVIEW, you may possibly think this article from the *Railroad Gazette* worth re-publication; as being calculated to awaken the attention of thinking men to this subject. There is a similarity between Missouri and English legislation in that the same hesitancy to give the Commissioners entire control over rates has been exhibited in both.

Respectfully yours,

GEO. C. PRATT.

A bill has recently been introduced into Parliament making important changes in the powers of the English Railway Commission. It is by no means certain to pass at this session; but whether it passes or not, it foreshadows the course which English railroad legislation is likely to take in the immediate future. It is no mere haphazard proposal, like so many of the bills brought before Congress. It is officially introduced by Mr. Chamberlain, President of the Board of Trade, and is based upon the report of a strong Parliamentary Committee which had spent two years in studying the questions at issue. It may be taken as expressing the deliberate views of a number of leading Englishmen of both parties.

It is now eleven years since the English Railway Commission was established. It was a new piece of machinery for carrying out an old law. The act of 1854 defined the relations between the railroads and the public. But it had remained to a great extent a dead letter. Cases constantly arose under it of which the courts would not and could not take cognizance. Others involved great delay and expense to the complainants; so great as to deter men from having recourse to the courts when the law was plainly on their side. To meet these difficulties the Railway Commission was established. It was intended to enforce those parts of the act of 1854 which the courts could not enforce, and to

secure quick comparatively cheap relief to those who could not afford the expenses of a long lawsuit.

It was avowedly an experiment—originally established for five years, renewed only for still shorter periods. It is neither a complete success nor a decided failure. Its best work is its indirect work. The fact that such a tribunal is there prevents a great many disputes from arising, and acts as a check upon arbitrary power. But the evidence before the committee of 1881–82 showed that its direct results left much to be desired. It was only empowered to deal with cases under the act of 1854, so that it often suffered for want of jurisdiction. It could not enforce decrees of *mandamus*. It could not prevent appeals from being taken to a superior court, so that if the railroad companies chose to contest the case it cost the complainant about as much time and money under the new system as under the old. The Commission suffered because its powers were so ill-defined. Some of these difficulties it is now proposed to remove. The effect of Mr. Chamberlain's bill, if adopted, would be to bring the powers of the Commissioners much nearer to those of an ordinary court of law. It gives them jurisdiction under the special railroad acts as well as under the general act of 1854. It enables them to enforce their authority like any other court. For the roundabout modes of procedure hitherto in use it substitutes an explicit right of appeal under some restrictions which are perhaps more apparent than real. Appeal is granted only in those cases where it shall be specially admitted either by the commissioners themselves or by a court of appeal. Of course the last exception makes the whole restriction amount to very little, though the railroad companies object strenuously that their right to appeal is too much restricted.

It is proposed to make the Commission permanent. No further change is to be made in its constitution. Many of the railroad men would have preferred a Commission composed entirely of lawyers, but the parliamentary committee considered this as out of the question. Provision is made by Mr. Chamberlain's bill for the occasional employment of technical assistance (assessors) in cases where it may be demanded.

The matter of direct control over rates is not settled by the proposed bill, and remains pretty much where it was before. On one point there is a curious compromise. The State has always exercised a certain control over the mileage rates of the English railroads, but the roads have claimed the right to make an arbitrary terminal charge—not merely the "handling terminals," for loading and unloading, but the "station terminals," for use of sidings, expense of signal men, interest on station buildings, etc. Under this head of station terminals the roads have claimed the right to charge what they pleased. The Commissioners have, in a very recent decision, denied their right to make any charge at all, holding that the legal mileage rates were intended to cover everything but "handling terminals." The present bill proposes that reasonable station terminals be granted to those roads (and only those) which submit a revised classification of goods under which their mileage rates may be regulated.

These are but a few among many provisions; but they are the only ones

affecting the Railway Commission which are likely to be contested. At present they seem to exasperate both parties. This is because they parcel off a piece of disputed ground where each party formerly claimed the whole. The railroad men held that there was really no occasion for the Commissioners; the shippers held that they ought to be allowed to settle pretty much everything. Therefore the railroad men are dissatisfied to see the Commission made permanent and given independent power; while the shippers are dissatisfied to see that power limited by the right of appeal, or the allowance of station terminals.

There can be no doubt that the bill offers some great advantages. It settles many points which have hitherto been at loose ends. It substitutes definite and efficient powers for vague ones. The one serious danger is that it may lead to a determined attempt on the part of the Commissioners to base rates upon cost of service instead of value of service. They have tried to do so in many cases which have come before them in the past. There is some reason to fear that they may, with their increased powers, pursue the same policy on a larger scale in the future.

CHOLERA—THE SAFEGUARDS OF AMERICA.

Dr. John B. Hamilton, Surgeon-General of the Marine Hospital Service, expresses the following opinion as to the possible danger of the introduction of Asiatic cholera into the United States, and of the means taken to keep it away.

He said that the United States kept up three quarantine stations. Of these, one is at Ship Island, near the mouth of the Mississippi, which is for all points on the coast of the Gulf of Mexico. The steamer Day Dream, which formerly belonged to the National Board of Health, is attached to this station, and there is also a steam launch for boarding vessels and removing sick to hospital. Surgeon Robert D. Murray, who has become noted in connection with the yellow fever epidemics, is in charge.

The second station is at Sapelo Sound, on the coast of Georgia, and is the quarantine for all ports between Key West and North Carolina. Acting Assistant Surgeon George H. Stone is in charge, having the sloop Gypsy as a tender and boarding vessel, and has an assistant at the hospital on the island.

The third station is the Cape Charles quarantine grounds, situated on Fisherman's Island, just inside of Cape Charles, and is the quarantine for Norfolk, Newport News, Richmond, Fort Monroe, Fredricksburg, Alexandria, and Washington, and all other ports on the Chesapeake or its tributaries, except Baltimore, which is in charge of the health officials there. The boarding vessel there is the steamer John M. Woodworth, and there are two steam launches. The officer in charge is Passed Assistant Surgeon Fairfax Irwin, and Dr. Hubbard remains at the island, where a temporary hospital building seventy feet in length has recently been completed.

The large seaports—Philadelphia, New York, and Boston—are attended to

by the local health officers, and it is believed the precautions are sufficient and thorough.

Quarantine at Ship Island, for the Gulf ports, exists throughout the whole year, while at Sapelo Sound and Cape Charles it begins May 1st each year, and continues until December.

Being asked if he had heard of the prevalence of cholera abroad before the publication of the press dispatches yesterday morning, Dr. Hamilton said he had not before heard of its reaching the continent of Europe, but he knew that precautions had been taken as long ago as last year on account of its prevalence in Egypt, and had been advised that quarantine against Egypt had been declared at Malta over two months ago.

The continuance of the disease at Calcutta throughout the winter was known, and interesting reports had been made by Surgeon Major McLeod, of the British army, on the subject. It is still in doubt whether the cholera, which made such ravages at Damietta, Egypt, last year, was brought there from Calcutta by the Indian troops. The English officials alleged that the disease was caused by the large number of dead and decaying animals in that neighborhood, but recent researches prove that while disease resulted from that cause it did not produce the cholera.

Official reports received here through the State department from Calcutta show that the cholera has been increasing there steadily for the past four months, and also that it is prevalent on the eastern coast of China. This latter fact was known months before its publication in yesterday's dispatches.

The commission sent out last year by France, under the leadership of Pasteur, and by Germany, under Dr. Koch, determined the active principle of the germ, "bacillus," of cholera, but vitally disagreed as to its location. The French commission reported the bacillus to be present in the blood, while the Germans declared that it was located in the intestines.

Much controversy was excited by these conflicting theories for a time, but Koch carried his commission to India, where the same result was found, and, further, he discovered the presence of the same bacillus as those found before in the stricken cities in Egypt, in the water-tanks at Calcutta. This solution of the subject is now generally accepted by the scientific world, and it has a distinct bearing on the means by which the dread disease is propagated as well as points directly to the means of stamping out and preventing it spread. Dr. Koch, however, was unable to obtain any results from his experiments in inoculating the lower animals, but now Surgeon Major McLeod reports that another medical officer in India (Dr. Richards) had obtained definite results by poisoning the common hog with the evacuations from cholera patients

The treatment of cholera patients at quarantine, based on the discoveries of Dr. Koch, will be to isolate the case as soon as the disease appears, and have all bedding and the evacuations of the patient destroyed by fire. This course is necessary to prevent the spread of the disease.

If the cholera spreads in France inspectors will be stationed at each of the

principal foreign seaports to examine all steerage passengers and crews, and instructions will be given collectors of customs to prevent the landing of any baggage belonging to passengers or men who have died during the passage at sea from any disease, as, although the death may be reported from something else, there is a possibility of the death having been from cholera.—*Nat. Republican.*

EDITORIAL NOTES.

PROF. CHAS. H. STERNBERG, of Lawrence, Kansas, and Mr. W. W. Russ, of the Kansas State University, are now out upon a geological excursion, collecting fossils for Prof. O. C. Marsh in the northwestern counties of that State. In Ottawa County they were fortunate enough to secure the head and cervical vertebræ of a Saurian whose extreme length, judging by the dimensions of the head, fifty inches, must have been over sixty feet. The remainder of the skeleton was thoughtlessly destroyed by the quarrymen who discovered it.

PROF. J. G. PORTER, of the United States Coast Survey, Washington, D. C., has been elected Astronomer of the Observatory of the University of Cincinnati, Ohio, to succeed Prof. Ormond Stone, who has taken a similar position at the University of Virginia.

MR. EDWIN HARRISON and Major F. F. Hilder, of the Committee on Science and Education, ask in behalf of the St. Louis Exposition Association the cordial co-operation of all who can assist them in making a display of such articles as can be classed as illustrations of any of the many branches of the above department. From inventors and manufacturers of apparatus and instruments for instruction and scientific investigation, they hope to receive such a display as will be creditable to the exhibition, and at the same time be of service both to the exhibitors and the public. From Colleges, Industrial, Polytechnic, Manual Training and other schools, they solicit exhibits of the work of students and scholars in every department of their respective courses In the great field of the natural sciences everything will be acceptable that will serve as an illustration of any department; collections, specimens, models and drawings will be welcome.

ON June 2d Dr. A. P. Lankford died at Lexington, Mo., at the age of forty-seven years. He was formerly engaged in the practice of medicine in this city, and filled the chair of surgery in the Kansas City Medical College. Subsequently he was selected to fill the same position in the Missouri Medical College at St. Louis, which he did most acceptably for about ten years, when his health gave way and he returned home to die at his father's house. Dr. Lankford was an able man and skillful surgeon, and was held in high estimation by all of his associates and acquaintances.

IN the catalogue of the Missouri University, for 1883-4, we find a valuable article by Prof. G. C. Broadhead upon the "Relation of the Soils of Missouri to Geology," also his report of work done in re-arranging and labeling the fossils and mineral specimens in the University Museum.

PROF. S. H. TROWBRIDGE, of Glasgow, Mo., writes: "I am pained to know that the REVIEW is still a financial weight, instead of the grand success it so richly deserves to be in your hands. It would be a calamity to many friends of popular science and improvment if its publication should cease."

PROF. E. D. COPE left yesterday morning for the East. The professor was very enthusiastic in regard to the Kansas City Academy of Science, which he said was one of the most active associations of its kind in the West. He also spoke in the most flattering terms of the Kansas City REVIEW OF SCIENCE AND INDUSTRY, edited by Col. T. S. Case, and said that it had done more for scientific and industrial progress than any other periodical west of the Alleghany Mountains. —*Kansas City Journal.*

WE have received the 42d Catalogue of the Missouri University. It is a handsome and voluminous document, illustrated with a cut of the main building as it will appear when the present work of enlarging is completed, and several other engravings of buildings, etc. We learn from it that the faculty consists of thirty-four professors, lecturers and instructors, that the means of illustration and instruction in the various departments are ample and of the most modern kinds, and that the number of students for the current year was 573, of whom 517 were from this State and the remainder represented sixteen States and Territories. The standard is high and the curriculum extensive and complete.

PROF. F. E. NIPHER, the noted physicist at Washington University, St. Louis, says in a recent letter: "I send payment for Vol VII, also for an additional year. I am sorry that I have not had time to write anything for the REVIEW lately, for I think it should be sustained, and our people in the West should be educated up to as high an appreciation of scientific work as possible and all of us should aid you in it."

THE Fifteenth Annual Commencement of the Kansas State Agricultural College took place June 8th to 11th inclusive. The annual examinations, conducted orally and in writing, were held in the several class-rooms and shops from 8:30 A. M. to 12:10 P. M., June 9th and 10th. The Baccalaureate Sermon and the annual addresses were given in the College Chapel where the Undergraduates Exhibition and the exercises of the graduating class were also held. Visitors were welcomed to all of these exercises, and given opportunities for examining the College in all its departments,—museums, laboratories, the farm and its stock and crops, orchards and forest plantations. The exercises were as follows: Sunday, June 8th, 4 P. M.—Baccalaureate Sermon by the President Rev. Geo. T. Fairchild, D. D.; Monday, June 9th, 8 P. M.—Undergraduates' Exhibition by members of the third-year class in charge of Prof. E. M. Shelton; Tuesday, June 10th, 8 P. M.—Annual Address by Hon. Geo. R. Peck, of Topeka. On Commencement Day, Wednesday, June 11th, 10 A. M. —Exercises of the Graduating class; 5 P. M. —Address before the Alumni Association by W. D. Gilbert, Class of '74; 8 P. M.—Alumni Reunion. Everything passed off in the most creditable manner. The degree of B. A. was conferred upon seventeen graduates, who were addressed by Hon. F. D. Coburn, of Wyandotte.

THE Missouri Teachers' Convention met at Sweet Springs on the 24th, 25th and 26th of June. There was a large attendance of the prominent educators of the State and the exercises were of an interesting character and of a higher standard than ordinary. We expect in the next issue of the REVIEW to publish some of the best papers that were read.

OUR old friend Prof. John D. Parker, now Chaplain in the U. S. Army, in addition to his military duties and true to his literary tastes, finds time to prepare and deliver an occasional lecture. He is now ready to receive proposals for courses of lectures upon meteorology and archæology, and can be addressed at Fort Hays, Kansas.

THE National Teachers' Association meets at Madison, Wisconsin, July 10th to 18th, and the indications are that there will be a very large number avail themselves of the many inducements offered to be present.

PROF. H. S. PRITCHETT, late of the U. S. Naval Observatory, and now Astronomer at Washington University, St. Louis, very encouragingly writes: "I can well understand that you may sometimes feel discouraged over the work you have been carrying on. Yet, when you compare the REVIEW, both as to number of subscribers and the character of its articles, with the various other efforts during the past ten years (chiefly in eastern cities) you have every reason to feel proud of it. I consider that you have done more for the advancement of science in the West since you started the REVIEW than any other one man. You will find all friends of science ready to admit this."

ITEMS FROM PERIODICALS.

Subscribers to the REVIEW *can be furnished through this office with all the best magazines of this Country and Europe, at a discount of from* 15 *to* 20 *per cent off the retail price.*

To any person remitting to us the annual subscription price of any three of the prominent literary or scientific magazines of the United States, we will promptly furnish the same, and the KANSAS CITY REVIEW, *besides, without additional cost, for one year.*

WE were much gratified to find the following in the *Popular Science Monthly* for June: "With its May number the KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY begins its eighth year. The REVIEW is doing an excellent work in stimulating an interest in science in the rapidly growing country west of the Mississippi. But very few of its articles are solely of local interest: a wide range of sciences is represented in its pages, while manufactures and the arts based upon science, including education, are by no means neglected."

THE immemorial institution of trial by jury, which for centuries has been regarded as one of the most essential rights of the citizen, and one of the most effective barriers against absolute power, is itself on trial today, and is required to show cause why it should not be discarded and a more effectual method of administering justice substituted for it, or at least why it should not be reformed so as to yield more satisfactory results. Some suggestions for the improvement of the existing jury system, presented by Judge Robert C. Pitman in the *North American Review* for July, under the title of "Juries and Jurymen," should, in view of recent notorious miscarriages of justice, receive the serious consideration of every thoughtful citizen. "American Economics," by Prof. VanBuren Denslow, is a lucid and forcible exposition of the grounds upon which the protection theory of national economy is based. Judge Noah Davis writes of "Marriage and Divorce;" Dr. P. Bender, whose subject is "The Annexation of Canada," sets forth the advantages likely to accrue to the United S ates from the absorption of the Canadian provinces; Prof. D. McG. Means, in an argument against "Government Telegraphy," subjects the management of the Post Office to a most searching criticism; Charles T. Congdon writes of "Private Vengeance;" and, finally, there is a symposium on the "Future of the Negro," by Senator Z. B. Vance, Frederick Douglass, Joel Chandler Harris, Senator John T. Morgan, Prof. Richard T. Greener, Gen. S. C. Armstrong, Oliver Johnson, and others.

FOR those of our readers who wish a most valuable and exhaustive discussion and description of "Emblematic Mounds" we can do no better than refer them to Rev. Dr. Peet's articles in the *American Antiquarian*. Dr. Peet has made these mounds a personal, laborious and discriminative study, and is probably one of the best American authorities upon the subject.

THE *Popular Science Monthly* presents the following attractive table of contents for July: The Great Political Superstition, by Herbert Spencer; Colorado for Invalids, by Samuel A. Fisk, M. D.; The New Theology, by Rev. George G. Lyon; Our Debt to Insects, by Grant Allen; The Fruits of Manual Train-

ing, by Prof. C. M. Woodward, Ph. D.; Are Science and Art Antagonistic? by M. M. Guyau; The Volcanic Eruption of Krakatau, (Illustrated); The Prevention of Hydrophobia, by M. Louis Pasteur; The Morality of Happiness, by Thomas Foster; Diseases of Plants, by D. P. Penhallow; Adaptation to Climate, by Dr. A. Berghaus; Glasgow's Bandy-Legged Children, by George Hay, M. D., (Illustrated); Sketch of Averroës, by George Jackson Fisher, M. D., (With Portrait); Editor's Table; The Survival of Political Superstition—President Eliot on Liberal Education; Literary Notices; Popular Miscellany; Notes.

Science continues to maintain the high standard of excellence aimed at by its accomplished editor, and may now be regarded as firmly established. Weekly, $5.00.

THE first number of the *American Meteorological Journal*, published by Mr. Burr, of Detroit, and edited by Professor M. H. Harrington, at Michigan University, Ann Arbor, Mich., has been received. It is neat in appearance and comprehensive in plan. Doubtless it will succeed, being the only strictly meteorological journal in the country.

THE *Art Interchange* of June 19 contained designs for fish dish and a half dozen fish plates. These designs show marine plants, fishes and shells arranged in a charmingly decorative way. A design in color for sofa pillow decoration, by the Boston Society of Decorative Art, is also given. A unique design of oak leaves and acorns, for larger dishes of dinner service, and an exquisite woodland scene, "The Ruined Abbey," by LaLanne, are also to be found in this issue. In Decorative Notes is given some interesting information as to novelties in pottery, porcelain, glassware, vases, lamps, screens, yacht pillows, photograph frames, sachets, birch bark calendars. In Notes and Queries department questions are answered relative to pastel painting, Kensington painting, siccatif de Harlem and siccatif de Courtray, decorative arrangement of peacock feathers, embroidery, the celebrated Duran palette, sketching on linen and brass work. Published by William Whitlock, 140 Nassau Street, New York. $3.00.

Harper's Magazine frequently hits a topic of the day, in its illustrated articles, with notable timeliness. The leading paper of the July number will be on "The Nile," a subject in which there is just now a good deal of interest all over the world, with illustrations by Sir Frederick Leighton, P. R. A., and from other sources. The timeliness is all the more remarkable when it is remembered that it is largely a matter of editorial prognostication, since the illustrated sheets of the *Magazine* are often made up by the editor nearly six months in advance of the date of the *Magazine*.

THE *Dial*, a monthly journal of current literature, published by Jansen, McClurg & Co., Chicago, $1.50 per year, began its fifth year in May with new and specially selected type throughout, and the promise of even greater beauty of execution than that in which it already is known to excel most journals of its class. It will continue its distinctive and approved features of exhaustive review articles by special writers, critical notices of important books, notes on interesting literary events, and other features completing its scope as a trustworthy and elegant journal of current literature.

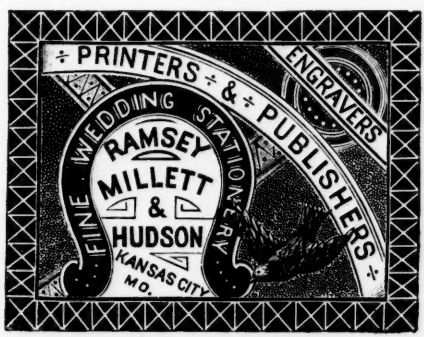
WE have received the January–April volume of the Proceedings of the Philadelphia Academy of Sciences, edited by Edward J. Nolan, M. D. It comprises 130 pp. with articles, more or less condensed, by such able and distinguished members and contributors as Prof. Joseph Leidy, M. D., Profs. Lewis H. Carvill, Asa Gray, Thomas Meehan, F. W. Putnam, David S. Jordan, Angelo Heilprin, Rev. H. C. McCook and others. This is one of the oldest scientific associations in this country, and has published some thirty-five volumes of its proceedings, besides many other works of high scientific merit. Application for these works may be made to the editor.

THE Franco-American Committee will deliver the Bartholdi Statue of Liberty Enlightening the World to United States Minister Morton, July 8th, in the presence of Prime Minister Ferry and a delegate representing President Grevy. The statue will be shipped to New York late in July.

ABOUT July 15th Messrs. Franc M. Paul and Albert B. Tavel will commence the publication of a semi-monthly trade journal under the title of *The Southern Miner and Manufacturer.* It will be devoted mainly to the development of the immense and varied resources of the South and their manufacture at home. It will be published at Nashville, Tennessee, on the 1st and 15th of each month. $2.00 per annum.

THE new models of the carriage and pontoons of the Eads Ship Railway have started for London. Nearly all the capital for the enterprise is being subscribed in that city. Chief Engineer Corthell says 100 men are at work and that the first half mile of track has been completed. This, with the river course, which admits three of the largest ships abreast, completes twenty-five and a half miles of the Tehuantepec route. The new pontoon system of raising vessels from the water upon the railway carriage is to be substituted for the hydraulic system first contemplated. It was conceived by London engineers and adopted by Eads, and will raise a ship out of water and upon the carriage in twenty minutes.

SIR W. THOMPSON, the eminent physicist, recently delivered a lecture before the Midland Institute on the "Six Gateways of Knowledge," using the word "six" as a supposed improvement on the old phrase, "five gateways of knowledge." The sixth or additional gateway was the sense of heat as distinguished from the sense of touch; but in reality the sense of heat is probably only another function of the sense of touch, and there is no absolute need to add another to the conventional five senses. Sir William also suggested that there was probably a "magnetic sense," that is to say, he believed that some people might be found who could tell the presence of magnetism acting on their person.



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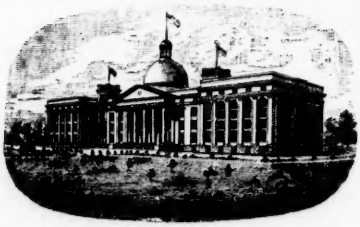

COLUMBIA, - MO.

The Academic, Agricultural, Normal and Engineering Schools will open the 2d Monday (8th) of September, 1884. The Law and Medical Schools will also open September 8th.

THE DEPARTMENTS OF INSTRUCTION ARE:

1. The Academic Schools of Language and Science.
2. The Professional Schools of Agriculture, Pedagogics, Engineering, Art, Law and Medicine, and at Rolla, the School of Mines and Metallurgy.

These Schools of the University are open to young men and to young women. Excepting in the Law, Medical and Engineering Schools, (each $40.00,) and the Commercial School, the entire expense for the year for tuition and contingent fees, is $20.00.

Board in private families, $3.00 to $4.50, and in clubs at about two-thirds of these rates.

In the means of instruction and illustration, none of the institutions of learning in Missouri have superior advantages. The association of the several schools with each other is deemed a circumstance of decided advantage. When, for example, a student has entered the Law or Medical School, he has access to all the departments of Academic instruction without any additional expense.

Commencement day is the first Thursday of June, 1885.

Send for Catalogue to Librarian, Missouri State University, Columbia, Missouri.

SAMUEL S. LAWS, President.